physical strength was not always answerable to the heavy demands made upon it by the energy of his will and his almost morbid sense of duty. He suffered at intervals from violent attacks of neuralgia or brow ague; and the long journeys which he was compelled so frequently to take on the Continent and elsewhere on the affairs of his company and otherwise, were well calculated, by accelerating the action of the heart, to induce the disorder to which he was ultimately to succumb. His interest in the present and his hopes in the future were, however, happily kept alive by his elder son and the present representative of his family, Mr. W. F. R. Weldon, M.A., of St. John's College, Cambridge, and Lecturer on Invertebrate Morphology at that University, married, in 1883, to the eldest daughter of his friend, Mr. William Tebb, of Albert Road, Regent's Park.

"Those who take interest in such matters may care to know that, though perturbing his mind little with party politics, Mr. Weldon was a staunch adherent of Mr. Gladstone. In religious belief, he was a Christian of the Swedenborgian type. These latter views and sympathies led him early to take an interest in the phenomena of modern spiritualism, which he had carefully investigated and in which he believed.

"A short time before his death, the writer received a letter from him, with the concluding paragraph of which he may be allowed to terminate these imperfect notes. 'The last time,' he said, 'I walked in my garden with my dear wife, I noticed, early as it was, the leaves on a certain tree turning brown. We were of course thinking of Dante*. I quoted to her these lines from verses of our poor friend Spencer Hall† :—

> "'The Autumn days are come again,
> The hedges redden in the lane,
> The leaves are golden on the tree,
> And golden memories bloom in me.'"

---

* His younger son, then recently deceased.
† We had met first at this gentleman's house.

London Section.

CHEMICAL SOCIETY'S ROOMS, BURLINGTON HOUSE.

Chairman: David Howard.

Committee:

Sir F. A. Abel.
H. E. Armstrong.
W. Lant Carpenter.
W. Crowder.
C. Graham.
S. Hall.
A. K. Huntington.

R. Messel.
B. E. R. Newlands.
B. Redwood.
T. Royle.
John Spiller.
G. C. Trewby.
J. Williams.

Local Sec. and Treasurer: Thos. Tyrer,
Garden Wharf, Church Road, Battersea, S.W.

MEETINGS, SESSION 1885—86.—First Monday in each month (unless otherwise indicated).

SPECIAL MEETING.

October 26.—Mr. Frederick Siemens, being in London, will attend the discussion of his Paper read at the last Annual Meeting, "On Heating Regenerative Gas Furnaces by Radiation from Flame, and on Producers to supply Gas specially Suitable for that purpose, and for the Recovery of By-Products."—(See Journal for July, 1885, pp. 4—39.)

ORDINARY MEETINGS.

First Monday in the Month, at 8 p.m.

November 2.—Dr. C. R. A. Wright, F.R.S., and Mr. C. Thompson—"Notes on the Chemistry of Soap." Mr. V. H. Veley—"On the Lime Process for the Purification of Coal Gas."

December 7.—Dr. P. F. Frankland on "Some Aspects of Filtration and other Methods of Water Treatment." Dr. F. L. Teed—"Note on the action of Calcium Carbonate on Solution of Ammonium Chloride."

January 4, 1886.—Mr. G. E. Davis—"On the Enrichment of Coal Gas by certain Hydrocarbons." Mr. C. T. Kingzett—"Notes on Russian Turpentine."

February 1.—Mr. Gustav Bischof—"Notes on Dr. Koch's Water Test." Mr. J. W. Westmorland—"The Estimation and Valuation of Copper Ores and Products for Commercial Purposes."

March 1.—Mr. Boverton Redwood—"Researches on Viscosity."

April 5.—

May 3.—Messrs. Macnab and Beckett—"The Treatment of Water for Technical Purposes."

June 7.—Dr. Meymott Tidy—"Chemical Treatment of Sewage."

July.—Annual Meeting at Liverpool.

Notices of papers and communications for the meetings to be sent to the Local Secretary.

Manchester Section.

Chairman: Sir H. E. Roscoe.

Vice-Chairman: I. Levinstein.

Committee:

R. F. Carpenter.
C. Estcourt.
H. Grimshaw.
B. W. Gerland.
Peter Hart.
T. Jackson.

D. B. Hewitt.
C. Schorlemmer.
Watson Smith.
L. Siebold.
Wm. Thomson.
D. Watson.

Local Secretary:
J. Carter-Bell, Bankfield, The Cliff, Higher Broughton, Manchester.

MEETINGS, SESSION 1885—86.—First Tuesday in each Month, at 7 P.M.

November 3.—W. Thomson—"Indiarubber and its Decay." Dr. B. Gerland—"Potassium Antimony Oxalate." G. E. Davis—"The Valuation of Crude Naphthas of Commerce."

December 1.—A. H. Allen—"Further Notes on the Chemistry and Analytical Examination of Fixed Oils." Watson Smith—"The Violet Stains appearing on Sized Cotton Cloth" (*Experimentally Illustrated*).

Notices of papers and communications for the meetings to be sent to the Local Secretary.

Journal and Patent Literature.

I.—GENERAL PLANT, APPARATUS, AND MACHINERY.

Improvements in the Production of a Compressed Gaseous Compound, for use in Gas Motors and for other purposes, and in Apparatus therefor. Emil Capitaine and Oscar Brünler, Berlin. Eng. Pat. 7581, June 22, 1885.

A SUITABLE liquid hydrocarbon is forced into a strong closed vessel to which heat is applied. The vapours evolved are allowed to escape under great pressure to a properly constructed receiver, passing on their way through an injector-like apparatus whereby sufficient air for combustion is drawn in and mingled with the vapours. This gaseous mixture is ready for explosion in the cylinders of gas engines, and is to be so admitted that the fresh charge expels the spent gases from the cylinder.
—A. R. D.

II.—FUEL, GAS, AND LIGHT.

Improvements in the Manufacture of Gas. J. Quaglio. Chem. Zeit. **9**, 959.

REFERRING to Fahnehjelm's invention, the author considers that an important step in the progress of the gas industry would be realised, should the process prove to be successful. It is based on the use of water gas for illuminating purposes without carburetting, by raising threads or needles of magnesia to a white heat by the flame of the gas. In discussing the improvements in the manufacture of gas during the last ten years reference is made to the use of gaseous fuel for heating gas retorts. It is stated that formerly all the coke produced in gas making was used as fuel, whilst at the present time the average consumption is only about 33 per cent., the Munich gas-works using as little as 15·75 per cent. of the coke produced. The first attempts to apply regenerative furnaces for the heating of gas retorts were made in Germany by Oechelhäuser, general manager of the Dessau works. Of the many systems now in use in Germany and England the author refers to the following as being the principal ones: Siemens' system, the process invented by Schilling and Bunte, and the Hasse-Didier and Hasse-Vacherot systems. These furnaces are constructed on the principle of utilising the waste heat by passing it through a series of flues and thus heating the air necessary for promoting combustion. A further improvement is the construction of a mouth-piece for gas retorts invented by Morton, which requires no luting. Hasse, of Dresden, has improved the construction of hydraulic mains, the object being to prevent the stoppage of the pipes. His apparatus admits of the removal of the tar, whilst the retorts are at work, 'without loss of gas. In conclusion the author briefly refers to the use of Körting's injectors for exhausters, the scrubbers patented by Kirkham, the construction of gasometer according to Sutze's principle and other arrangements relating to gas-making.—D. B.

Production of Coal in France during the year 1884. Chem. Centr. **16**, 590—591.

COAL AND ANTHRACITE.

Localities.	1883.	1884.
Nord and Pas de Calais	9,944,868	9,430,504
Loire	3,640,777	3,211,509
Gard	2,005,473	1,939,675
Bourgogne and Nivernois	1,635,580	1,605,631
Tarn and Aveyron	1,153,241	1,153,279
Bourbonnais	1,035,874	928,890
Auvergne	345,510	339,571
Hérault	277,898	272,659
Creuze and Corrèze	183,446	205,228
Vosges méridionales	207,455	192,017
Ouest	181,681	177,469
Ouest Alps	147,202	167,885
Maures	424	401
Pyrenees	—	—
Total number of tons	20,759,420	19,624,718

BROWN COAL AND LIGNITE.

Localities.	1883.	1884.
Provence	520,201	451,937
Comtat	30,764	28,727
Vosges méridionales	10,459	10,101
Sud-Ouest	11,065	8,950
Rhône Sup.	1,966	2,776
Total	574,455	502,491
Total	21,333,884	20,127,209

—S. R.

Calorific Power of Coal-gas variously diluted. A. Witz. Compt. Rend. **100**, 440.

When mixed with six volumes of air the calorific power is about 5200cal.; before passing through the scrubber and purifiers the same gas gave 5600cal. With 1·25 volumes of oxygen the calorific power was 5 per cent. higher, with 11 volumes of oxygen 4·6 per cent. lower, but with 10 volumes of air it was 2·5 per cent. higher than with six volumes.—S. Y.

The Revivification of Hydrate of Lime after it has been used for the Purification of Gas. John Reid, Birmingham. Eng. Pat. 1084, January 26, 1885.

The lime after being removed from the purifiers is put on an open kiln or stove in a layer of from four to five inches thick, and occasionally turned over. At a temperature of from 120° to 150° F. the impurities are driven off in from two to three hours.—S. H.

Improvements in Apparatus employed in the Treatment of Coal in order to obtain Coke and By-products therefrom. Richard de Soldenhoff, Merthyr-Tydvil. Eng. Pat. 11,967, June 3, 1885.

The coking ovens are of a rectangular shape, and provided on the side, just by the spring of the arch, with openings leading into a conducting flue situated above the side-wall and running the full length of each oven. Each conducting flue communicates with the main collecting flue which is above, and runs the entire length of the whole set of ovens. From the collecting flue the gases pass through two flues situated in the side walls of each oven, one above the other, and then through flues underneath the ovens to the chimney. The air necessary for combustion is heated by passing through small flues grouped about the heating flues beneath the ovens, and then passes to another flue situated between the two heating flues in the side walls. This flue is perforated on the top in one half of its length, and on the bottom in the other half, so that a good distribution of the air is effected, and perfect combustion of the gases ensured. As an alternative arrangement the gases may be led from the conducting flues to suitable washers and scrubbers, returning thence to the collecting flue, and being burned as above described. When this is done it is proposed to pass the gases through a refrigerating condenser consisting of a tube fitted with a screw to lengthen the passage of the gas; the tube being placed in a tank within which cold water is constantly circulating. (Compare this Journal, iii. 510 and 511.)
—A. R. D.

Improvements in and relating to Apparatus chiefly designed for Utilising the Waste Heat from Coke-Ovens, or other Furnaces for Evaporating, Calcining, and other purposes. C. Kingsford, London. Eng. Pat. 2379, June 12, 1885.

Above a coke-oven the inventor disposes a series of tray-shaped shelves so that the gases evolved in the coking may be burned and pass under and over each shelf in succession. Liquids are admitted to the topmost shelf in such quantity that as they flow downwards from shelf to shelf the evaporation is completed when they reach the bottom, where the residue is removed through a manhole.—A. R. D.

Improvements in Apparatus for the Combustion of Liquid Fuel. J. D. Bodwell, San Francisco. Eng. Pat. 7615, June 23, 1885.

This apparatus consists of a closed chamber provided with air inlets and with an opening in one of the sides near the top, for the escape of the products of combustion. The interior is fitted with a series of shelves, one below the other, sloping downwards from the sides, and reaching about two-thirds of the distance across the chambers. Oil is admitted to the topmost shelf and falls from shelf to shelf, burning during its passage, the shelves meanwhile presenting the appearance of sheets of flame. When it is intended to use this apparatus for heating water, pipes containing the water, preferably placed so as to allow of its circulation therein, are arranged suitably in the heating chamber.—A. R. D.

Apparatus for Combustion of Liquid Fuel. Jno. Imray, London. From H. de Bray and C. D. Rosetti, both of Cairo. Eng. Pat. 12,990, June 24, 1885.

This invention applied to an ordinary Cornish boiler may be described as follows: An oil-tank communicates with a retort situated in the crown of the fire flue by a pipe in which is inserted an air or steam jet. From the retort a pipe leads the oil or gases to a receptacle on the fire bars, to which a supply of air under pressure is also admitted. From this receptacle several pipes provided with small holes run lengthwise in the flue. The gases issue from these holes and burn, heating the retort and also the boiler. The supply of oil to the retort is maintained by the air or steam-jet in the pipe leading from the oil-tank. The fire-bars are covered with some material which is a non-conductor, and excludes the air. A perforated pipe at the bridge of the flue supplies baryta, permanganate of potash or other oxidising agent, to effect the complete combustion of any imperfectly burned gases.—A. R. D.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, Etc.

Removal and Utilisation of the Waste Acid of Petroleum and Tar Works. Chem. Zeit. **9**, 777.

Of the numerous methods employed for removing or utilising the waste acids obtained in the purification of crude petroleum and naphtha, the process based on the decomposition of the acid into sulphurous acid is said to be the most useful. In the absence of sulphuric acid works the sulphurous acid produced may be converted into sulphites or thiosulphates, or it may be treated in accordance with Roessler's process, which depends on the fact that an acid solution of copper sulphate, if treated with sulphurous acid in the presence of air, converts a corresponding quantity of the acid into sulphuric acid, which is then allowed to act on metallic copper. The sulphurous acid may be used also for the decomposition of solutions of sodium phenate; it is necessary, however, to remove all empyreumatic substances, which is best effected by passing the acid through a series of vessels, some of which contain water and others concentrated sulphuric acid. The solution of sodium sulphite produced by the decomposition of sodium phenate with sulphurous acid is causticised with calcium oxide, and the calcium sulphite thus formed used for the evolution of sulphurous acid, whilst the caustic liquor is employed for the extraction of fresh quantities of phenol.

—D. B.

Direct Formation of Dibromothiophen from Coal-tar Benzene. Victor Meyer and Otto Stadler. Ber. **18**, 1884.

Thiophen is so much more easily acted on by sulphuric acid than benzene,. that a separation of the two bodies may be effected by means of this reagent, but the authors state that bromine gives still better results, the yield of bromo-derivative of thiophen being almost quantitative. A mixture of 500grm. of purest coal-tar benzene with 30grm. bromine was allowed to stand for several hours, being repeatedly shaken. Hydrobromic acid was copiously evolved and the liquid became almost colourless. It was washed with water and caustic soda, and the benzene distilled off from the water-bath. The residual dark-coloured oil was freed from bromine addition products by warming with alcoholic potash, and after addition of water it was hydrolysed. A light yellow oil separated from the distillate, and more was obtained by extraction with ether. The oil was dried with calcium chloride and distilled, and yielded 13grm. of almost pure dibromothiophen. Experiments on the large scale were carried out in the Höchst Dyeworks (formerly Meister, Lucius and Brüning). By the action of 12kilos. of bromine on 200kilos. of benzene, 3·85kilos. of a heavy oil were obtained, and from 100grm. of this the authors obtained 31·7grm. dibromothiophen and 5grm. monobromothiophen. In a second experiment 1kilo. of crude oil yielded 360grm. of the pure dibromo compound.

—S. Y.

On the Reduction of Nitrothiophen to Amidothiophen. Otto Stadler. Ber. **18**, 1490.

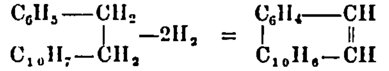
This reduction is attended with considerable difficulty, for by the use of ordinary reagents, such as tin and hydrochloric acid, stannous chloride and hydrochloric acid, ferrous sulphate and ammonia, ammonium sulphide, sodium amalgam, zinc dust and acetic acid, zinc dust and ammonia, hyposulphurous acid and so on, either no reaction takes place, or it is so violent that the thiophen molecule is destroyed with evolution of hydrogen sulphide. The author has succeeded in effecting the reduction by dissolving 1grm. mononitrothiophen in 50cc. of alcohol saturated with hydrogen chloride and adding gradually 2grm. granulated tin. The tin is completely dissolved, and a tin double salt of amidothiophen crystallises out, and may be obtained pure by washing with alcohol. The mother-liquor on evaporation yields more crystals, which are best purified by washing with ether. The double salt has the composition

$$(C_4H_3SNH_2.HCl)_2 + SnCl_4.$$

The base was set free by adding the theoretical quantity of hydrogen potassium carbonate, in complete darkness. A clear yellow oil is thus obtained which rapidly becomes resinous even in the dark.—S. Y.

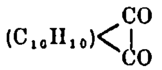
On Chrysene. E. Bamberger and J. Kranzfeld. Ber. **18**, 1931.

According to Graebe and Bungener, who have obtained chrysene by synthesis from benzylnaphthylmethane, the constitution of this hydrocarbon may be thus expressed—



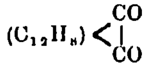
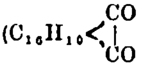
$$\begin{array}{l} C_6H_5 - CH_2 \\ \qquad\quad | \\ C_{10}H_7 - CH_2 \end{array} - 2H_2 = \begin{array}{l} C_6H_4 - CH \\ | \qquad\quad \| \\ C_{10}H_6 - CH \end{array}$$

so that chrysene is a phenanthrene in which in the place of a phenylene group C_6H_4, the bivalent naphthalene complex $C_{10}H_6$ occurs. The object of the present research was to confirm the formula for chrysene by analytical means. According to Liebermann, chrysoquinone has the formula $C_{18}H_{10}O_2$. It contains two carbonyl groups in neighbouring positions thus:—



$$(C_{10}H_{10}) < \begin{array}{l} CO \\ | \\ CO \end{array}$$

The correctness of this supposition is proved by the colour which chrysoquinone exhibits when treated with potash, and is supported by the properties which characterise the following derivatives: Chrysoglycollic acid, chrysoketone, chrysofluorene alcohol, and chrysofluorene. The two carbonyl groups of chrysoquinone exhibit reactions similar to those produced by phenanthrenequinone and retenequinone, the ortho-position of which has been conclusively determined. When chrysoquinone is boiled with aqueous solutions of alkalis, chrysoglycollic acid is obtained in precisely the same manner as that in which under similar conditions diphenyleneglycollic acid is produced from phenanthrene. When chrysoglycollic acid is oxidised with potassium dichromate and sulphuric acid, chrysoketone is formed, which on reduction is converted into chrysofluorene alcohol and chrysofluorene; diphenyleneketone when treated under the same conditions yields fluorene alcohol and fluorene. The following is a comparison of the corresponding phenanthrene and chrysene-derivatives:—

 $(C_{12}H_8) < \begin{array}{l} CO \\ \vert \\ CO \end{array}$ Phenanthrenequinone.	 $(C_{16}H_{10} < \begin{array}{l} CO \\ \vert \\ CO \end{array}$ Chrysoquinone.
$(C_{12}H_8) > C(OH).COOH$ Diphenyleneglycollic acid.	$(C_{16}H_{10}) > C(OH).COOH$ Chrysoglycollic acid.
$(C_{12}H_8) > CO$ Diphenyleneketone.	$(C_{16}H_{10}) > CO$ Chrysoketone.
$(C_{12}H_8) > CH.OH$ Fluorene alcohol.	$(C_{16}H_{10}) > CH.OH$ Chrysofluorene alcohol.
$(C_{12}H_8) > CH_2$ Fluorene.	$(C_{16}H_{10}) > CH_2$ Chrysofluorene.

—D. B.

Improvements in the Preparation of Mineral Oils for Woollen Manufacturing and other Purposes. J. Swallow, Armley. Eng. Pat. 13,043, July 1, 1885.

To one ton of mineral oil is added 11lb. of borax and 17lb. of common soda in aqueous solution. The whole is agitated together, boiled for a few minutes, and then allowed to stand. The solution sinks to the bottom, and is separated in any convenient way. The oil is now again stirred up with a mixture of fullers earth and water, which is also afterwards allowed to settle out and separated. This process removes from the oil qualities that impair its usefulness for rag-pulling, scribbling, and other operations in the woollen manufacture, and also materially diminishes its inflammability.—A. R. D.

Purifying Paraffin Oils. G. T. Beilby, Midcalder. Eng. Pat. 13,446, July 6, 1885.

After the elimination of the basic and acid impurities with sulphuric acid and caustic soda in the usual way, the oil is mixed with a solution of caustic soda in ethyl or methyl alcohol and agitated in a vessel constructed to minimise the loss of alcohol by evaporation. The alcoholic solution of soda holding the impurities, sinks to the bottom on standing, and is separated by decantation. It is treated with open steam to drive off the alcohol. The supernatant oil in the mixing vessel retains a considerable quantity of alcohol, which must be removed by distillation.—A. R. D.

IV.—COLOURING MATTERS AND DYES.

On a New Easy Method of Preparing Diamidotriphenylmethane. G. Mazzara. Gazz. Chim. 15, 50.

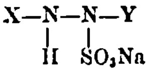
The method described by Fischer (*Ann.* 206, 147) is modified as follows:—A mixture of 45grm. benzaldehyde, 90grm. aniline and 100grm. fuming hydrochloric acid, is boiled for some hours in a flask with reversed condenser, the product is diluted with much water, filtered from resinous matter, and the triphenylmethane precipitated by caustic soda in the form of white flakes, which are washed with hot water and recrystallised from benzene. The crystals lose one molecule of benzene at 110°, and then melt at 139°.—S. Y.

Liebermann's Phenol Dyes. T. Lehmann and J. Petri. Chem. Centr. 16, 483—486.

By the action of nitrosyl-sulphonic acid on phenol two very similar colouring matters are obtained, one of which has been described by Liebermann, whilst little is known of the other. The authors prepared the first of these bodies according to Liebermann's directions and investigated its physical properties as well as those of one of its nitro-compounds. The dye is soluble in methyl, ethyl, and amyl alcohols, forming a yellow solution, and in ether, chloroform and acetone; it is less soluble in benzene and toluene, and insoluble in petroleum spirit. It dissolves in concentrated sulphuric acid, giving a dark blue-green colour. Such solutions of different strengths the authors examined spectroscopically, and found that they have characteristic absorption bands; their positions and variations with strength of solution are given in the paper. The dye is soluble in fuming nitric acid, forming a dark brown solution. If the liquid after filtering through glass wool be treated with water, the dye is precipitated as a dark green amorphous substance, which when dried at 100° C. has the following properties. It is soluble in ether giving a chlorophyll-green solution with a carmine-red fluorescence, which is very perceptible even in nearly colourless solutions; also in alcohol and acetone, giving a similarly coloured liquid, mineral acids dissolve it, giving a brown solution. The green colour is destroyed by alkalis and reproduced by acids. The original dye appears to undergo some change when heated with sulphuric acid to about 130° C., and a colouring matter is obtained which when well washed does not show two characteristic absorption bands, shown by the solution of the original dye, and it gives in alkaline solution a blue-violet colour instead of a blue green solution. The colouring matter so obtained resembles litmus in its behaviour, and the authors suggest it as an indicator. The preparation of this body is as follows:—5cc. phenol are mixed with 5cc. of concentrated sulphuric acid and the mixture is cooled, and then 20cc. of nitrosylsulphonic acid are introduced in small quantities at a time. The mixture is heated for some time on a water-bath at about 80° C., and is tested from time to time until the absorption band B½C—D¼E due to the dye makes its appearance. On pouring the solution into 2 litres of cold water the dye separates as a dark-violet amorphous substance. It is filtered, washed and dried at 100° C. It is readily soluble in acetone, ether, and ethyl, methyl, and amyl alcohols, not so soluble in chloroform, soluble with difficulty in benzene and toluene, and insoluble in petroleum spirit. It is soluble in fuming hydrochloric acid to a yellow-red solution, Liebermann's dye when similarly treated giving a cherry-red colour. The spectroscopic properties of the dye are described in the paper. Fuming nitric acid dissolves it, and a dirty-brown body is obtained from this solution by the addition of water, which is soluble in ether, yielding a yellow-brown solution showing no fluorescence. It acts as a good indicator in alkalimetry, except in the case of ammonium salts.—S. R.

Note on a New Class of Sulphonic Acids of the Aromatic Series. Adolf Spiegel. Ber. 18, 1479—1482.

The author has already shown that azo-colouring matters, formed by the union of a diazo-salt with a phenol or a base, yield with bisulphites, compounds which are soluble in water. If the azo-compound exist as a sulphonate, the reaction takes place readily in a warm aqueous solution. With the free azo-compounds, insoluble in water, the reaction may be brought about in alcoholic solution, for the alkaline bisulphites are soluble in alcohol. The bisulphite compounds obtained from red azo-bodies form yellow solutions, those from blue form red. They all crystallise well, and the crystals are dark and lustrous. They are stable with dilute acids, but decompose when heated or treated with alkalis into the colouring matter and the neutral sulphite. Textile fabrics may, therefore, be dyed by treatment with the aqueous solution of the bisulphite of the azo-body, and subsequent steaming or warming with alkali. The bisulphites are formed by the direct addition of the two bodies, and may be represented by the general formula—



$$\begin{array}{ccccccc} X & - & N & - & N & - & Y \\ & & | & & | & & \\ & & H & & SO_3Na. & & \end{array}$$

The author has not settled yet whether the free acid is a stable or an unstable body, although he has noticed that, on treatment with concentrated acids, the solution becomes coloured before the original azo-colour is precipitated. In order to study the action of bisulphite on other azo-compounds, an alcoholic solution of azobenzene was treated with an alkaline bisulphite, when instead of direct union taking place, a shifting of the atoms occurred and a new sulphonate of benzidine, amidodiphenylsulphaminic acid, $NH_2.C_6H_4.C_6H_4.NH(SO_3H)$, was formed. The azobenzene was soon dissolved when the mixture was warmed on the water-bath, but white cauliflower-like masses soon separated. After some hours, these were filtered, washed with alcohol and water, and dissolved in soda. By addition of an acid a glutinous mass of the new body was precipitated. It has acid properties, and forms crystalline alkali salts—*e.g.*, $C_{12}H_{12}N_2O_3S$. That the sulphonic group is combined with nitrogen was shown by the action of concentrated sulphuric acid, which yielded benzidine sulphate, from which the base was liberated and identified. The sulphaminic acid evidently belongs to the group of bodies, the typical member of which was prepared by Fremy by the action of a nitrate on a sulphite (*Ann. Chem. Phys.* (3), 15, 408). When an aromatic nitroso-compound such as nitrosonaphthol is warmed with a bisulphite, the former is dissolved, and on addition of an acid, a yellow powder soluble in alkali is precipitated. It is reprecipitated from its alkaline solution by addition of an acid, and when heated with water to 150° yields naphthohydroquinone. Also some nitro-compounds, for instance nitrophenanthrenequinone, were acted on by bisulphite, and similar results obtained.—S. Y.

Theory of the Formation of Rosaniline in the Nitrobenzene Process. M. Lange. Ber. **18**, 1918.

It is usually assumed that the nitrobenzene in supplying the oxygen required for the rosaniline formation is itself reduced to aniline and partly enters the rosaniline molecule. The author considers that this is not the case, but that the nitrobenzene loses its nitrogen and is completely reduced to benzene. 40grm. of a mixture of aniline and toluidine were half neutralised with HCl and heated with 20grm. of nitrobenzene and a small quantity of ferric-chloride or ammonium vanadate to 190° ; besides rosaniline the melt contained phosphine, an induline-like body, and diphenylamine, and benzene occurred in the distillate. The same melt was obtained by replacing the nitrobenzene by chloronitrobenzene, no chlorinated rosaniline being formed. Exactly the same result was produced by the employment of nitraniline, dinitrobenzene, nitronaphthalene, etc., nitrogen being evolved and the hydrocarbon formed. If pure paratoluidine, half neutralised with HCl, was heated with nitrobenzene and ferric-chloride, hardly any rosaniline was obtained, whereas if the nitrobenzene were reduced to aniline during the process rosaniline must have been produced. If nitro-bodies containing methyl groups be used the reaction is more complicated, since the CH_3 groups appear to get oxidised off and form the neuclei of the rosaniline molecules. Thus if pure aniline (obtained by repeated treatment with small quantities of iodine until it no longer gave rosaniline on heating with nitrobenzene) was half neutralised with HCl and heated with *p*-nitrotoluene and $Fe\ Cl_6$, a good yield of rosaniline was obtained, and the distillate contained benzene. The same result was obtained by the employment of *o*-nitrotoluene, *p*-nitrotoluenesulphonic acid, dinitroxylene, and trinitromesitylene, the rosaniline formed being in all cases identical. With dinitroxylene and trinitromesitylene an evolution of methylchloride and chlorinated derivatives of methane was noticed during the reaction. —A. G. G.

Cochineal and Cochineal Carmine. C. Liebermann. Ber. **18**, 1969.

The present state of the literature of this subject is very defective ; for instance, the author finds that the finest kinds of cochineal contain only about 10% of pure colouring matter, whereas the percentage usually given is 34—50, and also in many other points arrives at conclusions different from those previously given. The percentage of colouring matter in ordinary cochineal was determined by precipitating the aqueous solution with lead acetate, purification of the lead compound, determination of the lead contained in it, and of the colouring matter by difference. Cochineal carmine is insoluble in alcohol, and nearly insoluble in water. An analysis of a very pure specimen gave the following results:—

Water	·17	per cent.
Nitrogenous substances	20	,,
Colouring-matter	56	,,
Ash	7	,,
Wax	traces.	

The nitrogen, which amounts to about 3·7% on the dry carmine, is probably chiefly present as albuminous substances, since on fusion with KOH a smell of indole is produced. The ash contained—

Al_2O_3	43·1	per cent.
CaO	44·8	,,
MgO	1·0	,,
Na_2O	3·2	,,
K_2O	3·6	,,
P_2O_5	3·2	,,
SnO_2	·7	,,

and small traces of Fe, Cu, and SiO_2 ; the tin and copper are probably only accidental impurities. The Ca, Al, and Mg are present in the proportion

$$Al_2O_3 : \overbrace{CaO+MgO} = 1 : 2$$

analogous to the proportion of Al to Ca found by Kopp in fabrics dyed with Turkey-red. The dyestuff dissolves in ammonia to a clear solution from which the Al and Ca cannot be precipitated. On heating the dry carmine to 180° it is converted into ruficarmine, and at a still higher temperature (250°) evolves CO_2, apparently showing that the dyestuff is a carboxylic acid. The author could obtain no confirmation of the statement that the dyestuff is a glucoside.—A. G. G.

On the Wax and Fat of Cochineal. C. Liebermann. Ber. **18**, 1975.

The statement that cochineal contains stearin and margarin is erroneous. The author has separated a wax and a fat neither of which contain the above bodies. The wax is obtained by extracting the cochineal with benzene, and consists almost entirely of a substance to which the author gives the name coccerin. After the removal of the coccerin the fat is extracted with ether ; it consists of myristin and an oil containing fatty acids. The following are the percentages of coccerin in various samples of cochineal (extracted with benzene whole):—

Silver cochineal	1·0	per cent.
Mexican silver cochineal	1·7	,,
Teneriff silver cochineal	2·0	,,
Zaccatille	0·5	,,
Teneriff black cochineal	0·7—1·0	,,
Mexican black cochineal	1·5	,,
Granilla	4·2	,,

By powdering the cochineal before extraction the percentages increased by about one-half, except in the case of Granilla, where the granules are exceedingly small. The percentage of myristin is on the average about 1·5—2·0, and of fluid fat and fatty acids 4·0—6·0, so that the average total quantity of wax and fat contained in a silver cochineal is about 12%. After recrystallising from benzene or acetic acid coccerin forms thin glistening plates of melting point 106°, it is sparingly soluble in all cold solvents and nearly insoluble in alcohol and ether. It has the constitution $C_{30}H_{60}(C_{31}H_{61}O_3)_2$. On saponification with alcoholic KOH it gives cocceryl alcohol $C_{30}H_{60}(OH)_2$ and cocceric acid $C_{31}H_{62}O_3$. The alcohol forms a white crystalline powder of melting point 101—104°. The acid melts at 93° and is soluble in hot alcohol, benzene, etc. ; its ethyl ether melts at about 70°. The myristin $C_3H_5(OC_{14}H_{27}O)_3$ forms colourless crystals of melting point 55°, easily soluble in warm alcohol, etc.; on saponification it gave glycerol and myristic acid $C_{14}H_{28}O_2$ of melting point 54° and boiling point 248° at 100mm.—A. G. G.

Improvements in the Manufacture of Extracts and Liquors of Logwood. C. E. Avery, Florida, U.S. Eng. Pat. 7630, June 23, 1885.

This process consists in heating the logwood with chlorates or nitrates to the boiling point, or preferably under pressure at heats above the boiling point. A logwood yielding 10% hæmatoxylin requires about 1·4% of its weight of $KClO_3$ or nearly 3% of $NaNO_3$. The inventor claims that by this method the hæmatoxylin is completely oxidised to hæmatein, and that therefore there is no necessity for the use of oxidising substances in the subsequent dyeing or printing ; and hence no loss by precipitation in the dyeing and no risk of tendering in the steaming after printing. He claims also that the colour yielded is fast. Hypochlorites acting in the cold give the same result, but are not so uniform in their action.—J. H. H.

V.—TEXTILES: COTTON, WOOL, SILK, Etc.

Improvements in the Treatment of Cotton Seed for the Removal of Fibrous Matter therefrom, and an Apparatus therefor. William Henry Stead. Eng. Pat. 13,831, October 20, 1884.

Cotton-seed is placed in a cylindrical pan having a perforated false bottom. Through the bottom of the pan a vertical shaft armed with stirrers passes ; this can be driven at any speed by suitable gearing. The seed is

moistened with strong sulphuric acid and the stirrers set in motion. The proportion of acid varies from 2½ to 4lb. per 100 of seed. The stirring is continued until the fibres surrounding the seed are detached from the seeds in the form of a fine powder: this escapes through the false bottom and through a spout provided for the purpose. The seed is then sprinkled with powdered lime, the stirring being continued. The excess of acid is thus removed as a fine powder of sulphate of lime and the seed is left clean. A thin coating of lime dust remains, however, which can be easily removed by means of a brush and screen. A drawing accompanies the specification.
—E. J. B.

An Improved Process for Treating old cotton, or other Ropes, and Cotton or other Waste, to be used as Engine-cleaning Waste. H. M. Semmons and V. Nathan. Eng. Pat. 14,338, October 30, 1884.

The patentees open—if required—the ropes or other waste by the usual methods, and then dye the materials with aniline or other dyes. They claim that the dyeing "removes or counteracts the grease in the materials and leaves the waste in a better condition for absorbing oil" when used as engine-cleaning waste.—J. H. H.

Improved Apparatus for Wool-washing. L. A. Groth, London. From A. Mouchablon, Paris. Eng. Pat. 14,962, November 13, 1884.

The inventor proposes a mechanical arrangement for a continuous operation. For particulars and drawing of the arrangement the original specification should be consulted.—H. A. R.

Treating Animal and Vegetable Fibres for Textiles, Cordage, and other Uses. Wesley Washington, Hamilton. Eng. Pat. 6922, June 8, 1885.

In this invention animal fibres, as cow-hair and vegetable fibres, like short jute or short flax, etc., which by reason of their structure and length are unsuitable for spinning and weaving purposes, are treated in such a way as to render them suitable for these purposes. The method consists in subjecting the fibres to great pressure in one or more directions. The fibres thus treated are found to possess a certain amount of curliness which greatly improves their spinning properties. The fibre, say, for example, jute, in lengths of about two inches, is shaken up in order to intermingle the fibres and then closely packed in a strong iron cylinder. It is then subjected to such pressure that 65lb. are forced into a space of one cubic foot, for about five minutes. The mass of fibres is then removed and is replaced in the cylinder in such a way that those portions previously occupying a vertical position are now placed horizontally—pressure being again applied as before.—E. J. B.

Treating Animal and Vegetable Fibres for Textiles, Cordage, and other Uses. Wesley Washington Hamilton. Eng. Pat. 6923, June 8, 1885.

This patent differs from the preceding one in that the mass of fibres, after having undergone the pressure treatment, is then tightly bound with cord or wire and boiled in water for one hour. The fibres are then opened out by hand and carefully dried.—E. J. B.

VI.—DYEING, CALICO PRINTING, PAPER STAINING, AND BLEACHING.

Contribution to the Chemistry of Mordants. On the Behaviour of the Solutions of some Salts of Chromium. L. Liechti and H. Schweitzer. Mitth. des Techn. Gewerbe-Museums in Wien, May, 1885. (Compare this Journal, 1883, 537.)

In this paper the authors have studied the behaviour of the solutions of some salts of chromium, the object being to obtain some useful data for the dyeing and printing industries. Normal and basic sulphates, thiocyanates, acetates, sulphacetates, nitro-acetates and chloro-acetates were prepared from chrome alum and chromium sulphate. The behaviour on dilution and heating, as well as towards the fibre during mordanting, hanging and drying, was studied. Experiments were also made having regard to the action of precipitants on these mordants. The results obtained are embodied in a series of tables, which are now given in a more condensed form. (See pp. 588—591). From these tables it will be seen that the normal salts are not dissociated either on boiling or dilution. The basic sulphates are decomposed on diluting. A number of basic acetates, sulphacetates and nitro-acetates were dissociated, whilst the sulphate, thiocyanate and chloro-acetate mordants were not affected. It is further shown that the more basic the mordant the more readily it is decomposed on dilution with water and heating. Owing to the imperfect separation of the chromium, it was impossible to determine the end of the dissociation. The quantity of chromium oxide retained by the fibre during the operations of mordanting, drying and ageing was found to increase with the basicity of the mordant, the strongly basic sulphates yielding the largest quantity of oxide to the fibre, but numbers as high as in the case of some aluminium mordants were not obtained. The behaviour of chrome alum mordants differed from that of chromium sulphate mordants, a circumstance which affords further proof of the influence of potassium sulphate on the mordants prepared from chrome alum. In their previous communication the authors showed that only those basic aluminium acetates which contained a sulphate in solution were decomposed on dilution with water, and in this respect the behaviour of chrome alum mordants agrees with alumina mordants. In regard to the influence of precipitants, it was found that the results differed according as the solutions of the various mordants had been freshly prepared or kept for some time; for instance, freshly prepared chromium acetate resisted the action of precipitating agents more powerfully than after it had been kept. The authors consider that the changes of colour exhibited on heating the mordant solutions are due to the production of basic salts, and not the formation of modifications of chromium hydroxide.—D. B.

Use of Ammonium Carbonate for fixing Alumina Mordants on Cotton. J. Wolf. Mitth. des Techn. Gewerbe-Museums in Wien, May, 1885.

The author has made a series of successful dye tests with ammonium carbonate as a fixing agent for alumina mordants. The advantage gained by the use of this substance is said to depend on the circumstance that pure aluminium hydroxide is produced on the fibre, whilst with the usual cow-dung surrogates basic phosphates, arsenates, etc., are formed, the acids of which are less readily expelled, so that the operation of dyeing is prolonged. The action of ammonium carbonate was tried on the following mordants. The latter were made to contain 100grm. $Al_2(SO_4)_3 + 18H_2O$ in a litre :—

1. Aluminium acetate $Al_2\overline{Ac}_6$. The results were the same whether 5 or 10grm. of carbonate was added to one litre of the mordant. A temperature of 50° gave the best results. The action is more favourable with 20grm. carbonate per litre, and the best results are obtained with 40grm. in a warm solution.

2. Aluminium sulphacetate $Al_2SO_4\overline{Ac}_4$. As in the former case an increase in the amount of carbonate employed intensifies the colour, the best result being obtained when 40grm. of carbonate are used in a cold or warm solution.

3. Basic aluminium sulphate-thiocyanate—

$Al_2(SO_4)(CNS)_2(OH)_2$.

In this case satisfactory results were obtained with less concentrated fixing baths.

4. Basic aluminium thiocyanate $Al_2(CNS)_4(OH)_2$. Good results were obtained with smaller additions of carbonate than in the case of mordants 1 and 2.

It is recommended to try experiments on a large scale in this direction.—D. B.

On the Behaviour of Compounds of Aluminium in the presence of Alizarin. L. Liechti and W. Suida. Mitth. de Techn. Gewerbe-Museums in Wien, May, 1885.

THE authors have investigated the changes occurring in the practical operations of dyeing and printing with alizarin. The following is a summary of their observations :—

1. Pure aluminium hydroxide *per se* or in the form of a mordant is not dyed by alizarin unless a salt of calcium is present.

2. Normal aluminium alizarate $Al_2O_3(C_{14}H_6O_3)_3$ is obtained by the addition of aluminium sulphate to an ammoniacal solution of alizarin. It is soluble in water, alcohol and ammonia.

3. Basic aluminium alizarates. The following were prepared :—

(*a*) $Al_2(C_{14}H_6O_4)_{1\cdot5}(OH)_3$, insoluble in water, soluble in ammonia.

(*b*) $Al_2(C_{14}H_6O_4)(OH)_4$, insoluble in water and ammonia.

(*c*) $Al_2(C_{14}H_6O_4)_{0\cdot5}(OH)_5$, insoluble in water, sparingly soluble in ammonia.

All basic alizarates are insoluble in alcohol.

4. Normal calcium alizarate, $C_{14}H_6CaO_4$, is obtained by the double decomposition of calcium acetate or chloride and an ammoniacal solution of alizarin. It is a crystalline body, is sparingly soluble in water and is readily decomposed by acids (even oleic acid).

5. Basic calcium alizarates are produced by employing an excess of alizarin. They are soluble in cold water and ammonia. On heating the solution the normal salt is separated and a solution of ammonium alizarate obtained.

6. Excess of alizarin prevents the precipitation of aluminium salts by ammonia.

7. Aluminium calcium alizarates are obtained by dyeing aluminium hydroxide with alizarin in the presence of calcium salts. The following compounds were prepared :—

(1.) $(Al_2O_3)_3(CaO)_4(C_{14}H_6O_3)_{10}$
(2.) $(Al_2O_3)_3(CaO)_3(C_{14}H_6O_3)_8$
(3.) $(Al_2O_3)_3(CaO)_3(C_{14}H_6O_3)_{7\cdot5}$
(4.) $(Al_2O_3)_3(CaO)_3(C_{14}H_6O_3)_{6\cdot75}$
(5.) $(Al_2O_3)_3(CaO)_{1\cdot2}(C_{14}H_6O_3)_{3\cdot6}$
(6.) $(Al_2O_3)_3(CaO)_{2\cdot57}(C_{14}H_6O_3)_{6\cdot45}$
(7.) $(Al_2O_3)_3(CaO)_{1\cdot5}(C_{14}H_6O_3)_4$
(8.) $(Al_2O_3)_3(CaO)_{4\cdot5}(C_{14}H_6O_3)_{10}$
(9.) $(Al_2O_3)_3(CaO)_4(C_{14}H_6O_3)_{10}$
(10.) $(Al_2O_3)_3(CaO)_{4\cdot2}(C_{14}H_6O_3)_{10}$

All these lakes are insoluble in water. Nos. 1, 2, and 3 are readily soluble in ammonia; 4, 5, and 6, partially soluble in ammonia; whilst Nos. 7, 8, 9, and 10 are insoluble in ammonia. It is remarkable that lake 1 is readily soluble in ammonia and lake 9 insoluble, seeing that the composition of both is the same.

8. The formation of aluminium calcium alizarates shows that the absorption of lime by the lake depends on the amount of alizarin employed, although the absorption of alizarin is limited by the quantity of calcium present.

9. In most cases alizarin and Turkey-reds contain a large excess of alumina in comparison with the amount of lime and alizarin present.

10. On dyeing cloth mordanted with alumina in a bath of alizarin and calcium acetate, 1mol. i alizarin absorbs ⅓mol. lime.

11. The most probable formula for normal alizarin red (not soaped) is $(Al_2O_3)(CaO)(C_{14}H_6O_3)_3H_2O$.

12. This lake dissolves readily in ammonia, and its solution can be mixed with Turkey-red oil without being altered.

13. The compound $(Al_2O_3)(CaO)_2(C_{14}H_6O_3)_6$, described by Saget as alizarin or Turkey-red, is soluble in water.

14. This substance is not produced during the dyeing operation, even under pressure, but a basic lake is invariably formed.

15. On treating these lakes with Turkey-red oil, fatty hydroxy-acids are absorbed from the oil by the lakes. The sulphuric acid, set free by the decomposition of the fatty sulphuric ether, decomposes a corresponding quantity of the lake. Alizarin is liberated and the sulphates of calcium and aluminium are formed.

16. The ratio of lime to alumina is altered during the soaping process in the case of alizarin-reds as well as Turkey-reds. Alizarin-reds absorb fatty acids from the soap during this operation.—D. B.

Preparation of Carmine. L. Sedna. D. Ind. Zeit. 26, 105.

IN making carmine, care should be taken that the materials used are free from iron, that the water is soft, or better, distilled, and that soap has not been employed to wash the linen used. Temperature and light influence the colour of the product, the brightest tint being obtained when there is a maximum amount of sunshine. Madame Cenette recommends boiling 1kilo. of the cochineal with 75kilos. of distilled water for two hours, then adding 25grm. of pure saltpetre, and finally, after three minutes, 30grm. of oxalic acid. The whole is allowed to stand for three weeks, the liquid removed as far as possible by means of a pipette, and the carmine carefully dried. Carmine is readily soluble in ammonia, and is reprecipitated from this solution by acetic acid and alcohol. As starch and cinnabar are the common adulterants, the carmine can be dissolved out by ammonia, and the residue weighed to give the amount of impurity present.
—S. R.

A Black Stain for Wood. Chem. Centr. **16**, 543.

5KILOS. of logwood and 4kilos. of gallnuts are mixed with 18 litres of good vinegar, and the mixture allowed to stand for a week. At the end of this time 5 litres of water are added, and the whole evaporated to 10 litres in volume, and the clear liquid poured off. In another vessel 1kilo. of iron filings are heated with 5 litres of good wood vinegar, and the mixture stirred from time to time until the temperature rises to 16° C. The two liquids obtained in this way are mixed, and the pieces of wood to be stained are kept in the solution until the requisite colour is obtained.—S. R.

The Bleaching and Colouring of Straw. E. J. Hödl. Chem. Centr. **16**, 575—576.

THE natural colouring matter of straw can be removed by treatment with warm water and a weak ley containing 8 parts potash and 12 parts soda to 50 parts water. The straw is afterwards washed two or three times with still weaker alkali, and finally with warm water. The bleaching process consists in treating the straw first with chlorine, and then with sulphurous acid. But generally a delicate straw shade is required, and to obtain this, the already bleached material is immersed in a bath containing 1·5grm. of picric acid dissolved in 10kilos. of water. If, however, a pure white straw be desired, the partially-bleached material is treated with warm water, then with a dilute soda lye at 50° C. and afterwards in a chloride of lime bath. To this bath dilute hydrochloric acid is subsequently added, and the straw is removed after half-an-hour. Finally it is washed in a bath of one per cent. soda solution. The straw bleached by this method is pure white in colour and very pliant and elastic. The following recipes for dyeing straw are given. The quantities recommended in each case are sufficient to dye 10kilos. of straw. Black : Heat for two hours in a solution of 2kilos. log-wood and 500grm. sumach, then in a bath of ferric nitrate solution at 4° B. Another method is to add 125grm. of curcuma to the first solution, and substitute ferrous sulphate for ferric nitrate in the second. Grey : The straw is treated with sodium carbonate solution and a little lime, then with a solution of 2kilos. alum and 100grm. tartaric acid. For special shades a little cochineal or indigo carmine is added. A little sulphuric acid is added to neutralise the cochineal, and the straw is finally washed in acidulated water. Brown : Heat for two hours with 750grm. sandal-wood, 1kilo. curcuma, 250grm. sumach, and 600grm. logwood, and sadden the shade so obtained in a bath of copperas. Or, use 370grm. sandal, 500grm. curcuma,

TABLE I.—SULPHATES (ALUMS).

Formula.	Source.	Colour.	Dissociation on dilution. Beginning.	Dissociation on heating. Beginning.	Dissociation on dilution and heating (5 minutes). Beginning.	Attraction of the Fibre during Mordanting, Drying and Ageing.		
						Cr_2O_3 presented to the fibre.	Cr_2O_3 retained by the fibre.	Percentage.
1. $Cr_2(SO_4)_3$	Chrome alum.	Bluish green.	Is not dissociated.	Is not dissociated.	Is not dissociated.	0·2523	0·0045	1·78
2. $Cr_2(SO_4)_2(OH)_2$	Chrome alum and sodium carbonate.	Green.	85-fold dilution.	Ditto.	12-fold dilution.	0·2331	0·0177	7·59
3. $Cr_4(SO_4)_3(OH)_6$	Ditto.	Yellowish green.	16-fold dilution.	Ditto.	2·6-fold dilution.	0·2051	0·0464	22·62
4. $Cr_2(SO_4)(OH)_4$	Ditto.	Ditto.	1·5-fold dilution.	Ditto.	0·5-fold dilution.	0·3155	0·2762	87·54
5. $Cr_2(SO_4)_2(OH)_2$	Chrome alum and chromium hydroxide.	Ditto.	85-fold dilution.	Ditto.	10·5-fold dilution.	0·2952	0·0876	29·67
6. $Cr_4(SO_4)_3(OH)_6$	Ditto.	Ditto.	2-fold dilution.	Ditto.	0·25-fold dilution.	0·2558	0·1100	43·00

TABLE II.—SULPHATES.

Formula.	Source.	Colour.	Dissociation on dilution. Beginning.	Dissociation on heating. Beginning.	Dissociation on dilution and heating (5 minutes). Beginning.	Attraction of the Fibre during Mordanting, Drying and Ageing.		
						Cr_2O_3 presented to the fibre.	Cr_2O_3 retained by the fibre.	Percentage.
1. $Cr_2(SO_4)_3$	Chromium sulphate	Green.	Is not dissociated.	Is not dissociated.	Is not dissociated.	0·2501	0·0323	12·79
2. $Cr_2(SO_4)_2(OH)_2$	Chromium sulphate and sodium carbonate.	Yellowish green.	6·5-fold dilution.	Ditto.	2-fold dilution.	0·2193	0·0855	38·98
3. $Cr_4(SO_4)_3(OH)_6$	Ditto.	Ditto.	1·25-fold dilution.	Ditto.	0·3–0·4-fold dilution.	0·2102	0·1817	86·44
4. $Cr_2(SO_4)_2(OH)_2$	Chromium sulphate and chromium hydroxide.	Ditto.	10-fold dilution.	Ditto.	0·5-fold dilution.	0·2685	0·0751	27·95

TABLE III.—THIOCYANATES.

Formula.	Source.	Colour.	Dissociation on dilution. Beginning.	Dissociation on heating. Beginning.	Dissociation on dilution and heating (5 minutes). Beginning.	Attraction of the Fibre during Mordanting, Drying, and Ageing.		
						Cr₂O₃ presented to the fibre.	Cr₂O₃ retained by the fibre.	Percentage.
1. $Cr_2(CNS)_6$	Chromium sulphate and barium thiocyanate.	Violet.	Is not dissociated.	Is not dissociated.	Is not dissociated.	0·2335	0·0117	5·01
2. $Cr_2(CNS)_5OH$	Chromium thiocyanate and sodium carbonate.	Bluish-green with reddish reflection.	Ditto.	Ditto.	Ditto.	0·2279	0·0203	8·92
3. $Cr_2(CNS)_4(OH)_2$	Ditto.	Ditto.	Ditto.	Ditto.	Ditto.	0·2260	0·0325	11·38
4. $Cr_2(CNS)_3(OH)_3$	Ditto.	Green.	Ditto.	Ditto.	75-fold dilution.	0·2051	0·0429	20·88
5. $Cr_2(CNS)_2(OH)_4$	Ditto.	Bluish-green.	Ditto.	Ditto.	32-fold dilution.	0·2144	0·0722	33·67

TABLE IV.—ACETATES.

Formula.	Source.	Colour.	Dissociation on dilution. Beginning.	Dissociation on heating. Beginning.	Dissociation on dilution and heating (5 minutes). Beginning.	Attraction of the Fibre during Mordanting, Drying and Ageing.		
						Cr₂O₃ presented to the fibre.	Cr₂O₃ retained by the fibre.	Percentage.
1. $Cr_2\overline{Ac}_6$	Chromium sulphate and lead acetate.	Bluish violet.	Is not dissociated.	Is not dissociated.	Is not dissociated.	0·2332	0·0188	8·12
2. $Cr_2\overline{Ac}_5(OH)$	Basic chromium sulphate, $Cr_4(SO_4)_5(OH)_2$ and lead acetate.	Ditto.	Ditto.	Ditto.	Ditto.	0·2574	0·0663	25·75
3. $Cr_2\overline{Ac}_4(OH)_2$	Basic chromium sulphate, $Cr_2(SO_4)_2(OH)_2$ and lead acetate.	Ditto.	Ditto.	Ditto.	75-fold dilution.	0·2751	0·0813	29·55
4. $Cr_2\overline{Ac}_3(OH)_3$	Basic chromium sulphate, $Cr_4(SO_4)_3(OH)_6$ and lead acetate.	Green.	Ditto.	Is dissociated when heated gradually to 80—90°.	—	0·2200	0·1453	66·05
5. $Cr_2\overline{Ac}_2(OH)_4$	Chromium acetate and sodium carbonate.	Violet.	Ditto.	Ditto.	—	0·2368	0·1654	69·85

TABLE V.—SULPHACETATES.

Formula.	Source.	Colour.	Dissociation on dilution. Beginning.	Dissociation on heating. Beginning.	Dissociation on dilution and heating (5 minutes). Beginning.	Attraction of the Fibre during Mordanting, Drying and Ageing.		
						Cr_2O_3 presented to the fibre.	Cr_2O_3 retained by the fibre.	Percentage.
1. $Cr_2SO_4\overline{Ac}_4$	Chromium sulphate and lead acetate.	Bluish violet.	Is not dissociated.	Is not dissociated.	Is not dissociated.	0·3085	0·0784	25·41
2. $Cr_2NaSO_4\overline{Ac}_4(OH)$	Basic chromium sulphate. $Cr_4(SO_4)_5(OH)_2$, and lead acetate.	Ditto.	Ditto.	Ditto.	Ditto.	0·2797	0·0769	27·49
3. $Cr_2Na_2SO_4\overline{Ac}_4(OH)_2$	Basic chromium sulphate. $Cr_2(SO_4)_2(OH)_2$, and lead acetate.	Ditto.	Ditto.	Ditto.	65-fold dilution.	0·2644	0·0880	33·26
4. $Cr_2Na_3SO_4\overline{Ac}_4(OH)_3$	Basic chromium sulphate. $Cr_4(SO_4)_3(OH)_4$, and sodium carbonate.	Bluish green.	Ditto.	Is dissociated when heated gradually to 65—80°.	—	0·3102	0·2610	84·14

TABLE VI.—NITRO-ACETATES.

Formula.	Source.	Colour.	Dissociation on dilution. Beginning.	Dissociation on heating. Beginning.	Dissociation on dilution and heating (5 minutes). Beginning.	Attraction of the Fibre during Mordanting, Drying and Ageing.		
						Cr_2O_3 presented to the fibre.	Cr_2O_3 retained by the fibre.	Percentage.
1. $Cr_2(NO_3)_2\overline{Ac}_4$	Chromium sulphate, lead nitrate, and lead acetate.	Green.	Is not dissociated.	Is not dissociated.	Is not dissociated.	0·2358	0·0105	4·45
2. $Cr_2Na(NO_3)_2\overline{Ac}_4(OH)$	Chromium nitrate and acetate, and sodium carbonate.	Yellowish green.	Ditto.	Ditto.	Ditto.	0·2238	0·0245	10·91
3. $Cr_2Na_2(NO_3)_2\overline{Ac}_4(OH)_2$	Ditto.	Violet.	Ditto.	Ditto.	Ditto.	0·1911	0·0128	22·01
4. $Cr_2Na_3(NO_3)_2\overline{Ac}_4(OH)_3$	Ditto.	Ditto.	Ditto.	Ditto.	50-fold dilution.	0·2320	0·1124	48·44
5. $Cr_2Na_4(NO_3)_2\overline{Ac}_4(OH)_4$	Ditto.	Ditto.	Ditto.	Is dissociated when heated gradually to 75—80°.	—	0·2161	0·1493	69·09

TABLE VII.—CHLORO-ACETATES.

Formula.	Source.	Colour.	Dissociation on dilution. Beginning.	Dissociation on heating. Beginning.	Dissociation on dilution and heating (5 minutes). Beginning.	Attraction of the Fibre during Mordanting, Drying and Ageing.		
						Cr_2O_3 presented to the fibre.	Cr_2O_3 retained by the fibre.	Percentage.
1. $Cr_2Cl_2\overline{Ac}_4$	Chromium sulphate, lead acetate, and barium chloride.	Yellowish green.	Is not dissociated.	Is not dissociated.	Is not dissociated.	0·2211	[illegible]	12·13
2. $Cr_2Na_2Cl_2\overline{Ac}_4(OH)_2$	Chromium chloride and acetate, and sodium carbonate.	Bluish green with slightly violet reflection.	Ditto.	Ditto.	Ditto.	0·2018	0·0812	39·61
3. $Cr_2Na_3Cl_2\overline{Ac}_4(OH)_3$	Ditto.	Violet.	Ditto.	Ditto.	45-fold dilution.	0·1928	0·0967	50·15

—D. B.

100grm. sumach, and 350grm. log-wood, and afterwards soak the straw in a solution containing 2—3kilos. of alum, and remove when the colour is sufficiently intense. Violet: Heat for two hours with 2kilos. alum, 500grm. tartaric acid, and 500grm. stannous chloride. Straw can be very readily coloured with most of the aniline dyes, and can afterwards be rendered glossy with either gum or gelatine.—S. R.

Improvements in Dyeing Fabrics Aniline Black and in Apparatus therefor. C. R. Preibisch. Eng. Pat. 12,472, September 6, 1884.

The patentee has devised a new form of apparatus for the oxidation of aniline black which, he claims, gives an excellent black that does not rub off, and obviates all danger of the streakiness which appears in blacks oxidised by hanging in damp air. The apparatus is somewhat similar in form to the large continuous steaming apparatus of Messrs. Mather & Platt. The fabric saturated with the mordants is dried in the front part of the apparatus by means of a current of warm air which, by the aid of fans, is made to circulate between the folds of the cloth, and in the latter part is oxidised at a temperature of 44—50° C., the atmosphere of this portion being kept moist by the use of water troughs at the bottom of the apparatus. By means of guide rollers, the cloth is kept at a perfectly even tension, and proceeds at a uniform rate throughout. Noxious gases are removed as soon as formed by exhaust pipes along the roof. Aniline black on delaines can also be oxidised in this way, and the wool fibres left in a fit condition for subsequent dyeing with log-wood.—J. H. H.

A New Method of Dyeing Silk and Woollen Fibres with Insoluble Azo-colouring Matters. Dan Dawson and G. W. Oldham. Eng. Pat. 13,211, October 6, 1884.

The inventors have found that if a precipitated naphthol or similar body is added to a weak neutral solution of a diazo-compound, a bath is produced which slowly and gradually deposits an azo colouring matter. Presence of a slight excess of acetic acid further retards the reaction. Thus a 0·1 per cent. solution of xylidine or naphthylamine hydrochloride in excess of HCl, is azotised by means of a weak solution of $NaNO_2$: when the reaction is complete, pure chalk is added till the liquid is neutralised, and then at least 0·1 per cent. finely-precipitated naphthol along with acetate of soda and a little acetic acid. Silk or wool immersed in this bath are effectively dyed, and the rapidity of the operation may be regulated by the addition of a larger or smaller quantity of acetic acid.—J. H. H.

A New or Improved Process for Cold Scouring and Dyeing Cotton. W. H. Beck. From La Société Ch. Taussant et Cie., Paris. Eng. Pat. 13,258, October 6, 1884.

The patentee acts upon cotton in cops and fleeces in a vacuum apparatus with a 1 per cent. solution of what appears to be a very alkaline "soluble oil" of 50 per cent. strength. If the cotton is in hanks or skeins, the same solution is used, but in the open air. The dyeing operation for cops and fleeces is also conducted in a vacuum: for hanks and skeins in the open air in the ordinary way. If light shades are required to be dyed, ammonia or a carbonated alkali is used in the scouring, and the cloth is soured and washed before dyeing.

—J. H. H.

Improvements in Bleaching. C. F. Cross and J. P. Rickman. Eng. Pat. 13,078, October 16, 1884.

The cotton or linen goods, having been boiled with lime or alkali in the ordinary way, or steamed according to a former patent (Cross, 4984, Nov. 30, 1884), are immersed in an alkaline solution containing, preferably, about 1 per cent. Na_2O. Milk of lime may also be used. Excess of moisture is then removed, and the goods placed in an air-tight kier: from this the air is withdrawn and replaced by chlorine gas, with which the goods are allowed to remain in contact until the action is completed: or, if necessary, the goods may be again immersed in the alkali, and again treated with the chlorine. The process is best carried on in an apparatus similar to that patented by Thompson (595, Feb. 3, 1883), or in the case of piece goods in the apparatus patented by Mather (7909, May 19, 1884). In the latter case, alkaline solutions may be printed on the cloth, and the effect of a topical discharge produced by passing through the chlorine gas for a few seconds.—J. H. H.

A New Process of the dyeing Black on Cotton, Cotton Yarns, or Cotton Fabric, or other Vegetable Fibre. J. Clare. Eng. Pat. 14,225, October 28, 1884.

The goods are passed through log-wood liquor at 4° T., the excess of moisture removed, after which they are passed through a bath of copperas and alkaline sulphide, the use of the latter being the distinctive feature of the process.—J. H. H.

Improvements in Dyeing with Aniline Black. W. P. Thompson. From A. Descroix, of Villefranche. Eng. Pat. 14,276, October 29, 1884.

This process is applicable to woven fabrics and all kinds of textile material. A cold solution of aniline and a soluble bichromate, is printed or padded on the material, which is then wound upon a small roller, and left until the black is sufficiently developed: this requires from fifteen minutes to fifteen hours, according to the strength of the solution. The goods are then washed, soaped and finished as usual, and it is claimed that no tendering of the material takes place. The best proportions are two parts of bichromate to one part of aniline dissolved in sufficient acid to "saturate the alkali of the bichromate."

—J. H. H.

VII.—ACIDS, ALKALIS, AND SALTS.

Communication on Certain English Chemical Industries. Chem. Zeit. 9, 851 and 869.

Chrome Green (Guignet's green).—The materials employed for the manufacture of chrome green are acid potassium chromate and boric acid, which on heating give chromium oxide and potassium borate. It is necessary to subject the commercial boric acid to a process of purification which is best effected by dissolving the acid in water, treating the resulting solution with animal charcoal, and allowing the clear solution to crystallise. The crystallised mass is dried in centrifugal machines. The mother-liquor may be employed for dissolving fresh portions of boric acid, but should not be used more than four or five times. The charge consists of eight parts boric acid and three parts acid potassium chromate, both being in a finely-divided and intimately-mixed state. The furnace is so constructed that the flame first passes over the charge, and is then led away under the bed of the furnace. For each operation about 45kilos. of the above mixture is taken, the roasting being completed in about four hours. The temperature should not exceed that of a dark-red heat. The fused mass is thrown into water and washed repeatedly by decantation, the first and second wash waters being reserved for the recovery of the boric acid, whilst the third washings are used as water for the first extraction. The purified pigment is then placed on cotton filters, allowed to drain and passed through colour mills (wet mills). After grinding the mass is again washed with hot water, filtered and pressed, so that a product is obtained which contains 33 per cent. of dry matter, and yields 26 per cent. of residue when ignited. For the recovery of the boric acid the washings are evaporated in leaden pans to 13° B. and treated with hydrochloric acid, potassium chloride and boric acid being obtained. The latter crystallises out on cooling. The mother-liquors are concentrated to 20° B. The crystals which are thrown out are dissolved, and the solution is treated with hydrogen sulphide to remove the lead absorbed by the liquors. The mixture is filtered, the solution evaporated and allowed to crystallise. Only 65 per cent. of the boric acid originally employed is recovered.

Tin Salt.—The action of hydrochloric acid (which must be free from iron if a pure product is required) on tin is effected in stone vats capable of holding 400kilos. of tin, and 875kilos. hydrochloric acid of 20° B. Having introduced the charge it is heated gently for twelve hours, after which it is drawn off and allowed to settle. The clear solution is then concentrated in copper pans to 68° B. and allowed to crystallise. The crystals are dried on slate slabs or by centrifugal machines. In order to prevent the action of the tin solution on the copper pans it is necessary to have free tin constantly in the pan. The casks used for packing the crystals are lined with paper saturated with paraffin.

Sodium Stannate.—Ten half-round cast-iron boilers 0·75m. in diameter, and grouped together in horse-shoe form, are built in brickwork and heated gently by a furnace placed at one end of the series. A metal tube is fixed in the centre of each boiler, the lower end of which forms a perforated funnel. A syphon is dropped into the tube at the end of the operation in order to withdraw the tin solution. Each boiler is almost filled with granulated tin, and six out of the ten boilers are charged with soda ley of 15° B. The liquor is then passed from one boiler to the other until it shows a density of 30° B., when it is drawn off into an iron tank and allowed to settle. In order to prepare the "sodium stannate liquor," the solution is treated with the requisite quantity of common salt to reduce the amount of tin to 5 per cent., whilst for the production of the solid salt the solution is evaporated to dryness in a cast-iron boiler. After calcining the residue the dried salt is mixed with common salt, so that a product containing 42 per cent. of tin is obtained.

Nitric Acid.—For the manufacture of nitric acid cast-iron cylinders 0·75m. in diameter and 2m. in length, or cast-iron stills 3m. long, 1·4m. wide, and 0·9m. high, lined with stone slabs and set in brickwork, are used. The charge consists of 250kilos. of saltpetre and 310kilos. sulphuric acid of 60° B.

Arsenic Acid.—This acid is prepared by the action of nitric acid on arsenious acid. The operation is effected in stone vats, holding from 65 to 70kilos. of arsenious acid.—D. B.

Solubility of Salt Mixtures. Fr. Rüdorff. Sitzber. der Berl. Akad. der Wissensch, 1885, 355.

A large excess of the two salts, finely-powdered and mixed, was warmed with a known quantity of water, repeatedly shaken, and then allowed to cool to the temperature of the room. Three equal portions of this solution were taken, and to the first a known weight of one of the salts was added, and to the second a like quantity of the other salt, the third remaining unchanged. The three solutions were frequently agitated, and after some time filtered from the separated crystals and analysed. Two series of experiments were conducted. 1. When no chemical interchange was possible, as when two salts with the same acid or base were mixed. 2. When a double decomposition was possible, as when salts with two acids and two bases were mixed. This paper was confined to the consideration of the first of these two classes of reactions. When the two salts used were capable of uniting to form double salts—*e.g.*, ammonium and aluminium sulphate—there was a marked displacement of one constituent salt by the other, or rather a displacement of the double salt by one of its constituents. This was shown by adding one of the constituent salts in a finely-divided state to a saturated solution of the double salt. The same was the case with isomorphous salts, but with mixtures of salts which neither formed double salts nor were isomorphous no displacement of the one by the other was noticed. A molecular attraction exists then between the constituents of double salts, and between salts of the same isomorphous group, different from that between any two salts. The fact that double salts crystallise better from a solution which contains an excess of one of the two constituents is explained by these experiments. These phenomena can be shown in the case of isomorphous salts by the growth of a crystal of chrome alum in a saturated solution of ordinary alum, and by suspending a crystal of calcspar in a solution of ferrous carbonate in water charged with carbonic acid.—S. R.

On the Existence of Nitrous Anhydride in the Gaseous State. G. Lunge. J. Chem. Soc. (Trans.), 1885, 457.

THIS paper is entirely controversial, and the author criticises adversely the methods of experiment and the conclusions deduced in the researches of Ramsay and Cundall on the above subject, and complains that his own results had been overlooked by the later experimenters, who had adopted opposite views without disproving results previously published. The author maintains the validity of his deductions, which are to the effect that N_2O_3 may exist in the gaseous as well as in the liquid state. His argument as against his opponents is that their material must have been impure, and was obtained only by passing NO through a solution consisting practically only of N_2O_4, thus giving a source of error sufficient to invalidate their conclusions, and the accuracy of the analytical methods employed is also called in question. The author states that his own researches were conducted with nearly pure N_2O_3, which only partially and with difficulty combined with free oxygen present in large excess to form N_2O_4. This, together with his statement that the gases escaping from vitriol-chambers under normal conditions contain a large excess of free oxygen, although the nitrogen compounds are present only as N_2O_3, form his main argument for his own conclusions.—G. H. B.

On the Reaction between Nitric Oxide and Oxygen under Varying Conditions. G. Lunge. J. Chem. Soc. (Trans.), 1885, 465.

IN order to bring further facts to bear upon a controversy carried on by the author in a preceding paper, some experiments are described from which he formulates the following conclusions :—1. In the dry state, nitric oxide with an excess of oxygen combines to form N_2O_4 exclusively, or nearly so. 2. Dry nitric oxide and oxygen, with an excess of the former, yield a great deal of N_2O_3 along with N_2O_4, both in the state of gas. 3. In the presence of water, nitric oxide, with an excess of oxygen, is altogether converted into HNO_3. 4. If nitric oxide and oxygen meet in the presence of concentrated sulphuric acid, there is neither N_2O_4 nor HNO_3 formed even with the greatest excess of oxygen, but the reaction is $2SO_4H_2+2NO+O=2SO_2(OH)(ONO)+H_2O$. Further, it is not NO, but N_2O_3, which acts as carrier of the oxygen in the vitriol-chamber process. An addendum contains a reply to a criticism made at the reading of the paper, in which the author contends that in the gaseous state the N_2O_3 once formed is not oxidised by any excess of free oxygen, the same for the liquid N_2O_3 having been shown by other observers.—G. H. B.

On some Sulphur Compounds of Calcium. V. H. Veley. J. Chem. Soc. (Trans.), 1885, 478.

AFTER a historical retrospect of work done by others in the same field, the author describes in detail his experiments on the reactions of sulphuretted hydrogen over carbon disulphide upon lime, both in the dry and wet way. Careful elimination of impurities in the materials and precautions against outside influences are described, and the numerical results show a close accordance with the conclusions drawn. The author observed that perfectly-dry calcium oxide was unaltered by perfectly-dry hydrogen sulphide, and the main points of his paper he summarises as follows :—1. By the action of hydrogen sulphide on solid calcium hydroxide there is formed a calcium monosulphide in accordance with the equation—

$$Ca(OH)_2+H_2S=CaS+H_2O.$$

2. By the action of hydrogen sulphide on calcium hydroxide in aqueous solution there is formed calcium hydrosulphide in accordance with the equation—

$$Ca(OH)_2+H_2S+xAq=Ca(SH)_2+2OH_2+xAq.$$

3. Calcium hydroxyhydrosulphide $CaSH{\cdot}OH$ absorbs carbon disulphide with formation of unstable basic calcium thiocarbonates, decomposed slowly by hydrogen sulphide, and readily by carbonic anyhdride.—G. H. B.

Action of Ammonia on Solutions of Potassium Salts. H. Girand. Chem. Centr. **16**, 529 and 530.

MOST potassium salts are less soluble in water saturated with ammonia, than in pure water. Some salts—*e.g.*, sulphate, oxalate, ferrocyanide and phosphate—are partially precipitated when ammonia gas is passed into their saturated solutions. The chloride, nitrate, and chlorate are not so precipitated. When ammonia gas is passed into a very concentrated solution of potassium carbonate, no precipitate is formed, but the liquid separates into two layers, of which the upper contains the greater part of the ammonia, and the lower nearly all the carbonate. When strong ammonia solution is added to dry potassium carbonate, two layers are formed and a large quantity of ammonia is evolved. A saturated solution of potassium carbonate is not miscible with strong ammonia solution until a few drops of water be added. The volume of the two layers varies with the temperature. This can be more easily seen by colouring the upper layer violet with orseille red, which has no action on the lower layer. 29° C. appears to be a critical temperature, above which the two layers unite. On cooling below this temperature the liquid first becomes turbid, and then gradually separates into two layers. Potassium sulphate is the least soluble of all the potassium salts in aqueous ammonia. The author has determined the solubility of potassium sulphate in water containing different amounts of ammonia, and from his data a curve can be constructed. Both ammonium and sodium sulphates are easily soluble in aqueous ammonia, so that a solution of sodium or ammonium sulphate in saturated ammonia solution gives, with solutions of a potassium salt in saturated ammonia solution, a precipitate of potassium sulphate. Weak solutions of potassium salts which give precipitates neither with sodium bitartrate nor with platinic chloride (without the addition of alcohol), are easily thrown down if the solution be first saturated with ammonia and an ammoniacal solution of sodium sulphate added. This reaction cannot, however, be used quantitatively.—S. R.

Sodium Hypochlorite. Egmont Kutschera. Mitth. des Techn. Gewerbe-Museums in Wien, May, 1885.

IN a paper on Bleaching according to Thompson's Process, in the *Centralblatt Textil-Ind.*, November, 1884, it is stated that in decomposing bleaching powder with sodium carbonate in order to obtain sodium hypochlorite, half the bleaching power of the chloride of lime is lost. This statement is incorrect, as shown by the following equations, the accuracy of which the author has confirmed by actual experiment :—

1. $CaCl_2O+H_2SO_4=CaSO_4+H_2O+Cl_2$.
2. $CaCl_2O+Na_2CO_3=CaCO_3+NaCl+NaClO$.
3. $NaCl+NaClO_3+H_2SO_4=Na_2SO_4+H_2O+Cl_2$.

The first equation shows that one molecule of chloride of lime liberates one molecule of chlorine on treatment with an acid, the second equation expresses the change which takes place when bleaching powder is decomposed by sodium carbonate, whilst the last equation shows that on treating sodium chloride and sodium hypochlorite with an acid the same amount of active chlorine is liberated as is evolved by the bleaching powder from which these salts were originally produced.—D. B.

A Convenient Process for Preparing Tetrathionates of Alkalis. N. Klobukow. Ber. **18**, 1869.

THE process depends on the well-known reaction—$2Na_2S_2O_3+2I=Na_2S_4O_6+2NaI$. Finely-powdered iodine and the thiosulphate of an alkali are put in a basin containing a small amount of water, and the mixture is stirred until solution is effected. Iodine must be present in slight excess. The syrupy solution is then poured into a flask, partially filled with alcohol, when a copious white crystalline precipitate of the tetrathionate is at once formed. After two to three hours the latter is collected, washed with alcohol, dissolved in lukewarm water, and, after adding alcohol, allowed to crystallise over sulphuric acid in vacuo.—S. H.

Improvements in the Manufacture of Chromates of Soda, and in relation thereto. E. P. Potter and W. H. Higgin, Bolton. Eng. Pat. 3229, June 29, 1883.

Chrome ore is furnaced with lime and sodium sulphate The resulting material is lixiviated with water, and the liquor obtained is treated with hydrochloric acid until it is exactly neutral, when silica and alumina are precipitated. The purified solution is then boiled down. Sodium chloride and sulphate are thrown out in the crystalline form, removed by fishing and washed with neutralised vat liquor. The strong chromate solution remaining in the pan after filtering is boiled down to dryness, and the salt perfectly dried but not fused. By this process a bichromate of soda is obtained, which also contains monochromate. If pure bichromate be required, the purified vat liquor after removal of alumina and silica is treated with a further quantity of acid in exactly the quantity required to convert the whole of the monochromate into bichromate. -S. H.

Improvements in the Process of Manufacturing Ammonia. A. Feldmann, Bremen. Eng. Pat. 11,711, August 27, 1884.

The presence of lime mud in manufacturing liquid ammonia according to the usual methods considerably impedes the complete expulsion of the ammonia. The patentee, therefore, eliminates the insoluble lime compounds before distilling either by a filter-press or a centrifugal apparatus, and then proceeds in the usual manner.—S. H.

Improvements in the Purification of Bicarbonate of Soda and Apparatus therefor. H. Gaskell, Widnes. Eng. Pat. 11,775, August 29, 1884.

The invention relates to the purification of bicarbonate of soda made by the ammonia-soda process, which is always contaminated with ammonia. In order to expel the ammonia by volatilisation without decomposing at the same time the bicarbonate of soda, the mixture of both compounds is heated in an atmosphere of carbonic dioxide. The patentee devised a special apparatus for this purpose.—S. H.

Improvements in the Treatment of Certain Phosphatic Materials. H. Brunner, Widnes. Eng. Pat. 12,718, September 23, 1884.

Superphosphates made from phosphatic materials containing lead, copper, manganese iron, or alumina, in conjunction with calcium and magnesium compounds, are apt to "go back," that is, the phosphoric acid becomes again partially insoluble in water. The present invention is designed to prevent this reversion by separating the foreign bases. The finely-ground material is treated with hydrochloric acid, to convert into chloride all the calcium and magnesium present. A concentrated solution of calcium chloride is then added, in such quantity that not less than three equivalents of calcium or magnesium chloride are present to each equivalent of phosphoric acid. The mixture is then dried, calcined and roasted. Hydrochloric acid is evolved and condensed for after use. The mass after cooling is lixiviated with dilute hydrochloric acid and copper or lead, precipitated with sulphuretted hydrogen. Should the solution contain iron or aluminium phosphate in any considerable quantity owing to imperfect roasting, it may be removed therefrom by digesting the solution with precipitated di- or tri-calcium phosphate, which latter goes into solution, while iron and aluminium phosphate is precipitated. The calcium or magnesium phosphate in solution is precipitated by the addition of lime, and the remaining calcium chloride solution may be concentrated to be used in treating a fresh quantity of crude phosphates.—S. H.

Improvements in the Manufacture of Chromic Acid or Trioxide of Chromium. W. A. Rowell, Newcastle-on-Tyne. Eng. Pat. 12,834, September 26, 1884.

The reaction depends on the decomposition of barium and strontium chromate by sulphuric acid. It is carried out as follows:—Strontium chromate is prepared by mutual decomposition of strontium chloride and a neutral chromate. The supernatant liquor containing some strontium chromate in solution is treated with barium chloride, whereby all chromic acid is precipitated as barium chromate. The latter is then treated with hot dilute sulphuric acid in large excess, sulphate of baryta being formed, whereas chromic and sulphuric acid remain in solution. The mixture of the two acids having been separated from barium sulphate, is treated hot with an amount of strontium chromate equivalent to the free sulphuric acid present. This results in the formation of chromic acid in solution, and the precipitation of strontium sulphate. After separating the latter from the chromic acid, the solution is boiled down to dryness at a low heat. Chromate of strontium being completely decomposed by an equivalent of sulphuric acid, this process yields directly chromic acid which is free from sulphuric acid. In place of evaporating the solution of chromic acid to dryness, it may be concentrated to a considerable strength, and then precipitated by the addition of strong sulphuric acid, the mother-liquor being afterwards used for the decomposition of a fresh quantity of chromate of strontium.—S. H.

The Preparation of Chlorine Gas. J. Taylor, Cheltenham. Eng. Pat. 13,025, October, 1884.

Hydrochloric-acid gas, direct from the salt-cake furnace, is passed through a tower containing fragments of pumice-stone or coke, which is kept moistened by cold strong nitric acid. Chlorine, nitrosyl-chloride, water, and small quantities of nitrogen tri- and tetr-oxides, are thus formed. The mixed gases are passed into sulphuric acid, which absorbs the nitrous fumes, permits the chlorine to pass unchanged, and decomposes nitrosyl-chloride with the formation of hydrochloric-acid gas and nitrosulphonic acid. The reformed hydrochloric gas, along with the chlorine with which it is mixed, is a second time submitted to the action of nitric acid, and the gaseous products brought in contact with sulphuric acid. The resulting gas is put through the process a third time, and oftener, if required, until it is found to consist almost entirely of free chlorine. The nitrosulphuric acid formed in the process is decomposed by the gradual addition of water, whilst a rapid current of air is passed through the liquid. The nitrous vapours evolved are passed into water, whereby nitric acid is recovered, and by distilling the residual liquid containing a little nitric acid, that nitric acid is obtained, whilst the sulphuric acid is restored to its original condition.—S. H.

Improvements in the Manufacture of Algin and other Useful Products from Seaweeds. E. C. C. Stanford, Dalmuir, County of Dumbarton, N.B. Eng. Pat. 13,433, October 11, 1884.

In this invention improvements are proposed in the process described in Eng. Pat. 142, 1881, and consist in directly treating fresh or dried seaweed according to the "Wet Process," described in this Journal, iv. 518. The cellulose left behind having certain peculiarities, the inventor terms it Algulose. The clear solution is precipitated by dilute sulphuric or hydrochloric acid, and the crude alginic acid thereby obtained as a precipitate is washed and pressed into cakes, which are stored in a warm room where they become air-dry. The filtrate from the alginic acid is neutralised with dolly or limestone dust, the sulphate of lime precipitate allowed to settle, and the clear solution concentrated, to allow the sulphate of soda or chloride of sodium to crystallise out. The mother-liquor is next evaporated to dryness, and the residue is carbonised to form what is called kelp extract or kelp substitute, for the preparation of iodine and potash salts. Compared with the kelp of commerce, it contains nearly double the amount of salts, and more than double the amount of iodine, and is worth more than double the ordinary market price. The iodine and bromine may be directly precipitated by adding a copper salt. The iodine may be removed by setting it free by means of nitro-sulphuric acid or chlorine, and filtering it through charcoal or by distilling it off, if it be desired to remove it first. The alginates of the alkalis and alkaline earths can be used for stiffening woven fabrics and as mordants. The blue precipitate of alginate of copper formed by precipitating a soluble algin with a copper salt is soluble in ammonia, and becomes insoluble on drying, so that it may be used for waterproofing canvas or paper. The calcium, barium and strontium salts form useful white compounds, resembling bone, which when dry may be polished and turned. A combination of alginate of ammonia with shellac forms a tough flexible substance like gutta-percha, and is capable of replacing it in some of its applications. Further details of the properties and applications of algin will be found in this Journal, vol. iii. pp. 297—302, and iv. pp. 518—520.—A. W.

Improvements in the Manufacture of Sulphide of Zinc, and of Hydrate or other Salts of Baryta or Strontia. H. Knight, Liverpool. Eng. Pat. 16,220, December 18, 1884.

Barium or strontium sulphide is precipitated with an equivalent quantity of zinc chloride. After decantation from the precipitate of zinc sulphide, the filtrate is decomposed with caustic soda or potash, whereby barium and strontium hydrate is formed, which crystallises out on cooling. If other salts of baryta or strontia be required, their respective zinc compounds are employed for precipitation.—S. H.

Improvements in the Recovery of Ammonia in the Manufacture of Carbonate of Soda by the Ammonia Process, with Production of Sulphuretted Hydrogen. E. W. Parnell and J. Simpson, Liverpool. Eng. Pat. 1937, February 12, 1885.

The residuary ammonium-chloride solution from the ammonia-soda process is heated with alkali waste in a closed vessel, whereby ammonium sulphide is given off. This vapour is brought in contact with a solution of ammonium bisulphate. Neutral ammonium sulphate is formed with evolution of sulphuretted hydrogen. After boiling down to dryness the solution of ammonium sulphate, the dry sulphate is heated to about 800° F., when it parts with a portion of its ammonia, which latter is absorbed in brine and used for the production of sodium carbonate, while the acid sulphate of ammonia which is left behind is dissolved in water and treated with a further quantity of ammonium sulphide as described above. The sulphuretted hydrogen may be employed for the manufacture of very pure oil of vitriol. In order to facilitate the liberation of ammonia from ammonium sulphate, the heating is carried out either in an atmosphere of steam or by adding to the ammonium-sulphate solution before boiling down the sulphate of an alkali, which will form an acid sulphate or bisulphate, preferably sulphate of potash. This alkaline sulphate serves merely to absorb the acid given off from the bisulphate of ammonia, and can be used repeatedly.—S. H.

Improvement in the Manufacture of Bichromate of Potash. P. Roemer, Elberfeld. Eng. Pat. 7135, June 11, 1885.

Sodium bichromate is dissolved in boiling water to a concentrated solution and potassium chloride added. The whole is then maintained at the boiling point for some time. By this treatment a mutual decomposition takes place, potassium bichromate and sodium chloride being formed. On cooling, potassium bichromate separates out. The mother-liquor is concentrated so that sodium chloride is salted out, which is removed and washed with hot water. Instead of bichromate, the neutral chromate of sodium may be employed. In this case the solution is first sufficiently acidulated with hydrochloric acid to be transformed into bichromate, when the latter is treated as described.—S. H.

An Improved Method or Process for the Manufacture of Carbonate of Soda or Soda-ash. H. H. Lake. From Kayser, Young & Williams, Buffalo, U.S. Eng. Pat. 7355, June 16, 1885.

The said invention is based on the discovery that sulphate of soda, when exposed at a low red-heat to a current of carbon monoxide in the presence of a sufficient volume of carbon dioxide, is decomposed and converted into carbonate of soda, while the sulphur is driven off in the form of sulphurous acid. Sulphate of soda is prepared by the Hargreaves' process, and used in this process without removing the sulphate from the cylinders; a mixture of one equivalent of carbon monoxide, and one of carbon dioxide, is drawn by a fan through the apparatus, whereby the sulphate is converted into carbonate of soda, sulphurous acid gas being liberated, which is employed for making new quantities of sulphate of soda.—S. H.

VIII.—GLASS, POTTERY, AND EARTHENWARE.

Improvements in the Manufacture of Pottery. H. M. Robinson, Mintons Limited, and Leon Arnoux, Stoke-on-Trent. Eng. Pat. 12,081, September 6, 1884.

This invention is for the use of compressed air in equalising the pressure during the manipulation of plastic materials in moulds or on them, and for machinery for producing such plastic materials. An incidental advantage is claimed when compression is used internally to the mould, of expelling the moisture and preventing the falling in of delicate and thin work.—T.

X.—METALLURGY, MINING, Etc.

Slag from Thomas's Dephosphorising Process. C. Scheibler. Bied. Centr. **13**, 411.

The slag is prepared for the extraction from it of earthy phosphates and ferric oxide rich in manganese, by being roasted and then submitted to the action of water or steam. In consequence of the formation of calcium hydrate, the fragments of roasted slag fall to a very fine powder.—E. G. C.

Removing Mercurial Stains from Gold. B. Fischer. Pharm. Centr. 26, 187.

Mercury can be removed from gold articles by a wet process, consisting in rubbing them first with a paste consisting of powdered iodine and alcohol, and then adding a concentrated solution of potassium iodide. The mercury iodide at first formed on the gold is dissolved by the potassium iodide solution. The gold is unacted upon at ordinary temperatures, and can afterwards be polished in the usual way.—S. R.

The Selective Alteration of the Constituents of Cast Iron. T. Turner. J. Chem. Soc. (Trans.), 1885, 474.

The experiments described were undertaken with a view of diminishing the amount of manganese, but of leaving the silicon, if possible, unaltered, in a sample of siliceous cast iron, by exposing it in a molten state to the action of acid and basic slag. Sand and ferric oxide were employed in different proportions to furnish the different kinds of slag. It was found that but little alteration was produced by the action of sand alone, or mixed with ferric oxide, but with ferric oxide alone a marked alteration in the desired direction was obtained, and still more so by the action of an air-blast. But the alteration extended generally to the other constituents of the cast iron, and the author states that "these experiments tend to confirm the practice of the present day, as showing that when it is desired to selectively alter the constituents of iron or steel it must be effected, not by attempting to eliminate some obnoxious material, which can only be accomplished by seriously altering the amounts of other elements present, but it must be done by starting from a pure metal, and adding the constituent or constituents which are desired."—G. H. B.

An Enamel for Metals. Pol. Notizbl. 40, 125.

A MIXTURE of 12 parts borax, 20 parts soda, and 125 parts of flint glass is fused, poured on a cold plate, pulverised, and the powder mixed with a solution of soluble glass of 50° B. The metal is coated with this paste, and then heated gently in an oven until the coating is fused, and is then allowed to cool. It adheres firmly to all kinds of iron articles.—S. R.

Blum's Patent Method for the Recovery of Phosphoric Acid in Thomas's Steel Process. Berg. und Hütt. Zeit. 44, 225—226.

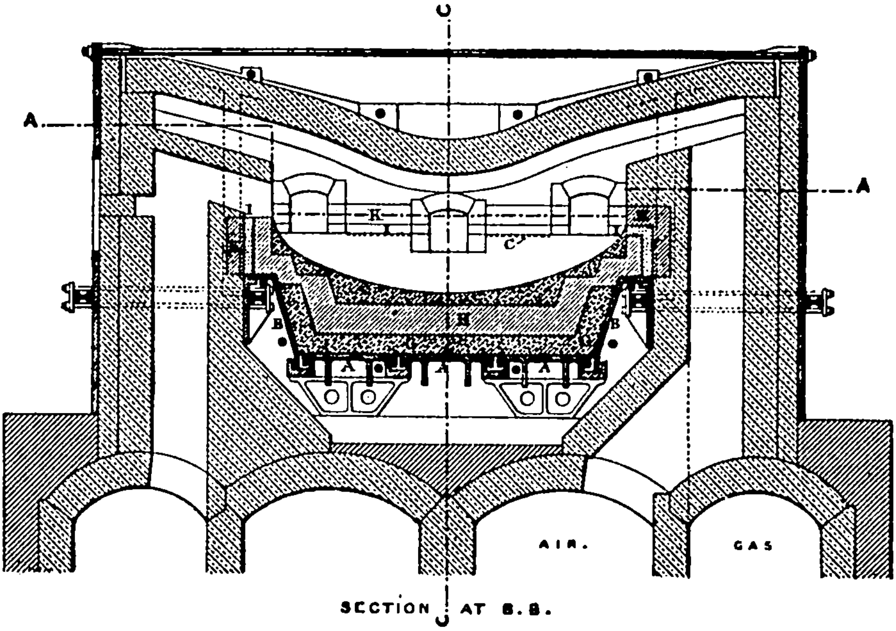
IN this method calcined sodium carbonate, free from sulphur, is substituted for the lime lining of the Thomas process, and in the proportion of 5·13 parts of soda to 1 part of phosphorus, and 7·85 parts to 1 part of silicon present in the iron. The soda is first put in the converter and in a fused state, and then the pig iron is introduced, and the blast is turned on and kept going until the phosphorus is removed; the converter is tipped, and the slag then poured out into an iron waggon. The slag contains, in addition to sodium phosphate and silicate, iron and manganese oxides, lime, magnesia and sulphur, and can be used as a manure, or the phosphate of soda can be extracted with cold water, the soluble glass with hot water, and the residue used for the preparation of ferro-manganese. At Creuzot, with a grey iron rich in silicon, lime is added to combine with the silica, and afterwards soda to unite with the phosphoric acid. From the Creuzot slag water extracts a large quantity of sodium vanadate, which was lost by the old process.—S. R.

Gold in the North of Japan. R. J. Frecheville. Proc. Inst. C.E. vol. 75.

IN the northern part of Hondo, a number of small veins, enclosed in a porphyritic rock, have been worked for gold from time immemorial at the Okudzu Mines. The veins average about one foot in width, and are filled with quartz and decomposed country rock, carrying disseminated crystals and thin bands of copper and iron pyrites, together with small quantities of zinc blende and galena. The gold is extremely finely divided, and can rarely be seen without pulverising and washing the ore. About 120 tons per month of ore, containing 1¼oz. of gold, were delivered at the floors at a cost of £4 per ton. The richest ore was crushed by a primitive stamp, then ground between flat stones like flour milling, but worked by hand, and the slime produced was washed over a sloping board scored with saw-cuts. The coarser portion, caught in a tub at the foot of the board, was ground again. The concentrations from the board were washed by hand in a shallow wooden dish, and the gold obtained was melted with borax and lead, and the product cupelled. About 50 per cent. of the gold was got by the first washing from ores assaying 2oz. per ton, and about 80 per cent. from the richest class of ores, which assayed 5oz. per ton and upwards. The tailings, after weathering for some time, were re-washed, yielding a further amount of gold. The author arranged a modern plant, consisting of a 10-stamp gold-mill, a slime separator "Spitz-Lutte," Rittinger's double side-blow percussion table, twelve Hungarian mills, strakes covered with scored boards to save fine gold from the slimes, and two flat-bottomed iron grinding pans. The pan-amalgamation gave 90 per cent. of the gold contained in the concentrates, and the result of the combined treatment by concentration and amalgamation was an average of 82 per cent. of the gold in the ore milled. A 40 H.P. multitubular boiler and engine, with cylinder 15in. diameter and 2½ feet stroke, supplied the power.—J. T.

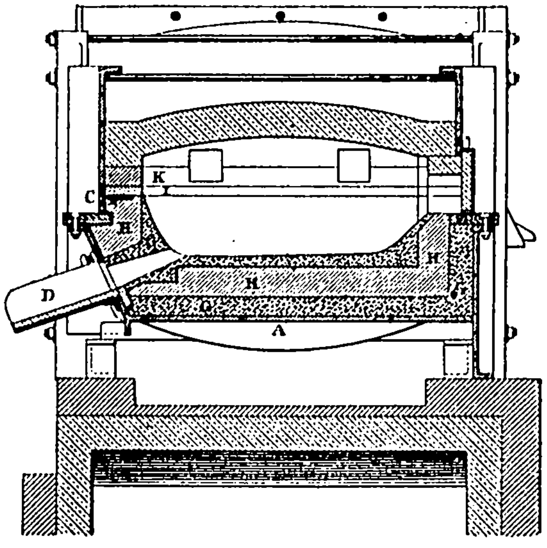
Basic, Open-Hearth, Steel Process. T. Gillott. Proc. Inst. C.E. vol. 77.

THE author made experiments, dating from May, 1882, at the Farnley Iron Company's works, near Leeds. According to Thomas and Gilchrist, pig-iron, suitable for the basic Bessemer process, should approximately contain silicon 0·5 to 1·8; phosphorus, 0·8 to 3·0; sulphur, under 0·3; manganese, not over 2·5 per cent.; and, in order to secure the necessary heat, the carbon would probably have to be 3·5 per cent.; but in the basic open-hearth process the proportion of heat-producing elements need not be high, and large quantities of wrought-iron scraps, which often contain 0·2 per cent. of phosphorus, may be converted into steel of great purity. As no basic bricks, excepting such as were too costly, were suitable for constructing the furnace throughout, the author consulted chemists as to materials which would be sufficiently refractory at a steel-melting heat, and at the same time securely isolate the dolomite lime basin of the furnace from the silica walls above. He was advised that magnesia on the lime, alumina above the magnesia, and silica brickwork carried up on the alumina, would be secure; so bricks were made from magnesite, containing 98 per cent. magnesium carbonate, and others from bauxite of the approximate composition, silica, 15; alumina, 82; lime, 1; iron sesquioxide, 2 per cent.; and with these the furnace was built in accordance with Figs. 1 to 4. This furnace had been previously used in the acid process for 50—55cwt. charges. Provision was made for the removal of the slags in the early stages of the process, so that the banks of the furnace might be preserved; and any phosphorus transferred to the slags could be withdrawn, so as to reduce the amount of purification at the later stages; this provision proved very useful. The iron bottom plates A and the bridge plates B are similar to those used for the acid furnace; brackets bolted to the side-plates of the furnace support the brickwork by the plate C at the level of the top of the lime basin, and prevent settlement of the upper brickwork in case of any shrinking of the lime basin or fluxing in work. The metal tapping hole and spout is at D, and the slag tap-holes are at higher levels EE on the opposite side of the furnace. Bricks made from magnesian lime, and of the following composition—Lime, 58; magnesia, 24; silica, 8; alumina and iron oxide, 10 per cent.—are burnt at a full white heat, crushed, mixed with hot tar in a mortar mill, and are taken immediately to the furnace and rammed with red-hot rammers over the parts G, wooden plugs being inserted to form the tap-holes, the parts marked H being walled in the same bricks, and grouted with material similar to the ramming. The isolating courses I and K, of magnesian and bauxite bricks respectively, are laid on the top of the brackets C, and across the ends of the basin over the plates B; and the shape of the hearth is completed by lime ramming. The use of hot rammers is necessary to coke the tar; otherwise the lime swells and falls to pieces in about twenty-four hours after mixing. The upper part of the furnace is then completed in silica-brick. After about seventy-two hours' firing, the furnace is ready for forming the bottom, and for this a full melting heat is necessary. Well-burnt and freshly-ground magnesian limestone is laid over the bottom and up the sides, with not more than 10 per cent. of ground fire-brick added, so as to flux the lining sufficient for binding the layer forming the furnace bottom. The tap-holes are stopped by dry lime only, or dry lime mixed with a little powdered coke. The gas- and air-ports should be so arranged as to throw the flame well down on the bottom, so that the heat may be sufficient to allow of the smallest possible admixture of silicious flux. The operation is thus conducted: Fresh well-burnt lime, about one-twentieth to one-tenth of the weight of the pig-iron, is laid upon the bottom of the furnace, the pig is then charged, and the wrought-iron or steel scraps are put on the top of the pig, all being cold. The whole of the charge if possible is placed in the furnace at the commencement. In three or four hours, the pig being melted, some slag can be tapped off. The first slag is generally very fluid, and more or less so as the silicon in the pig is higher or lower; consequently the sides of the hearth are preserved by getting rid of the more silicious slag before the full heat is reached. In three-and-a-half to six hours, the time being dependent on the proportion of pig to scrap, the whole charge will be melted, more slag can be taken off if required, some lime added if the slag is very fluid, and ore with the lime of the proportion of pig to scrap is high. When the boiling has ceased, and after the bulk of fluid metal has been well stirred, the metal may be sampled. The sample being satisfactory, the pasty slag may be raked off through the centre door, which is placed 4½in. lower than the two end doors. About 5 per cent. of hæmatite pig is then charged through the end doors on the bridges, which pig, when melted, causes the metal to boil more or less violently for about fifteen minutes. After this fifteen to thirty minutes are allowed to elapse, and any excess of slag beyond what is required to cover the metal in the casting ladle is removed, when the metal is ready for adding spiegel or ferro-manganese, and tapping. The addition of hæmatite pig causes a thorough agitation of the bath far beyond what can be done by stirring, and every analysis made proves a further removal of phosphorus by the addition. Occasionally, however, this after boil causes failure of parts of the hearth. Attempts to secure the quality of steel aimed at without adding pig at the end of the purifica-



SECTION AT B.B.

FIG. 1.

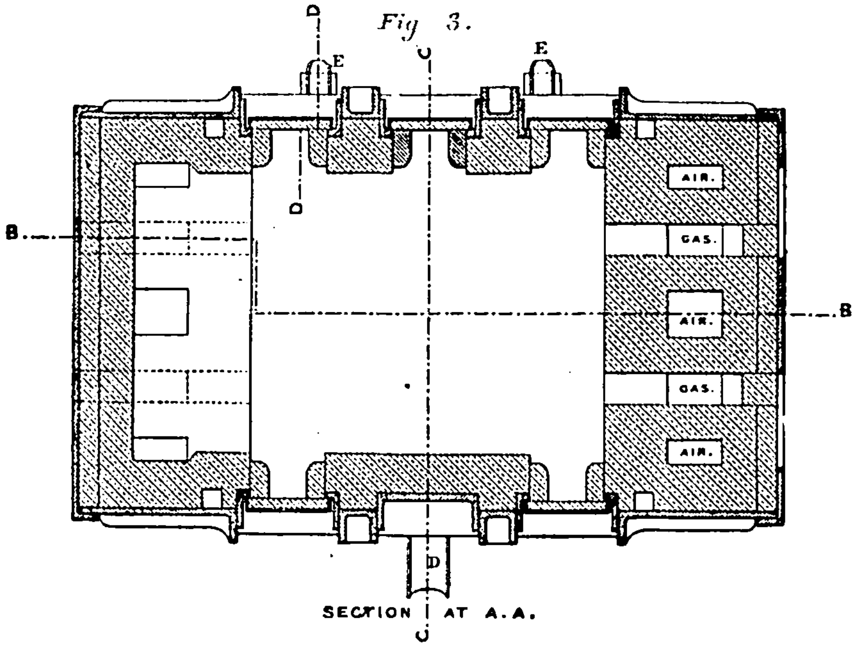


SECTION AT C.C.

FIG. 2.

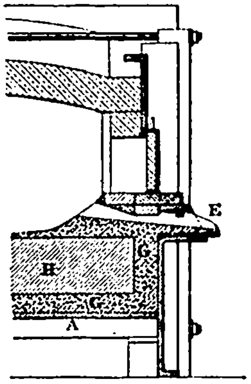
tion were made, but the results were uncertain and irregular. In only one instance has the author obtained evidence of re-phosphorisation on adding the ferromanganese after adding hæmatite pig. In this case the sample showed 0·104 per cent. of phosphorus, while the finished steel showed 0·122 per cent. In other cases where the two respective samples were tested for phosphorus, the reduction per cent. averaged 0·010, and varied from 0·008 to 0·025 less phosphorus in the steel than the trial samples contained. Highly satisfactory results were obtained; but it may be remarked that Farnley Best Yorkshire cold-blast pig has been the only phosphoric pig used; and being so low in silicon and sulphur, regular in quality, and more free from adhering sand than the cheaper hot-blast irons, much of the success obtained must be credited to the principal raw material used. To remedy certain defects of the experimental furnace, the author has designed the furnace shown—Figs. 5 to 9—in which the gas- and air-passages are carried up outside the walls of the furnace, an arrangement patented by Hackney and Wailes. Three doors for charging and repairing, and two slag spouts are provided on the opposite side to the tap-hole for the metal, and two sight-holes LL. Owing to the very soft quality of the steel produced, the heat required is nearly as great as Sheffield silica-bricks are able to withstand; so long as the slag can be kept clear

Fig 3.



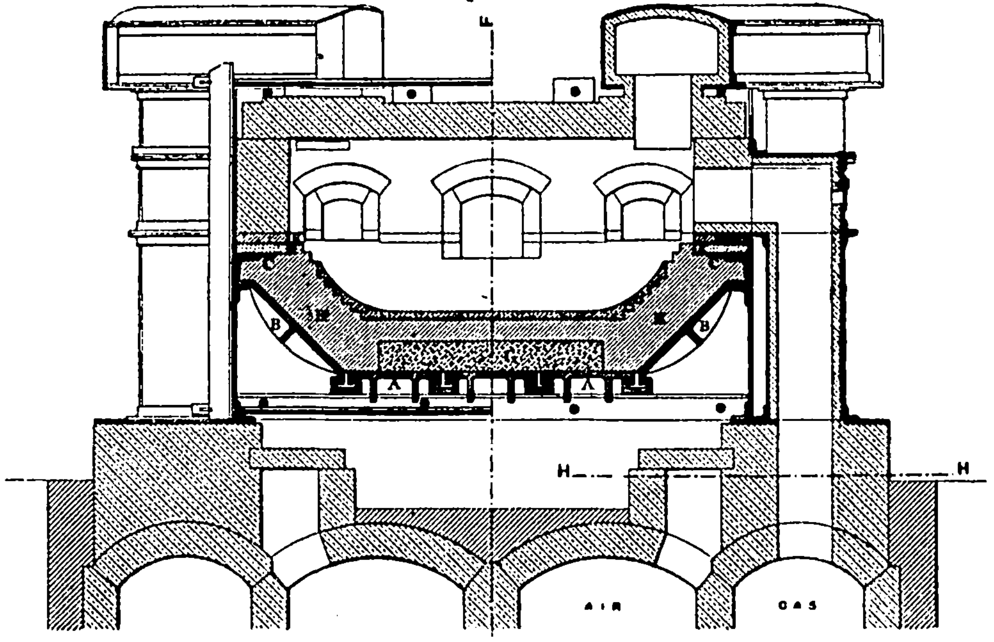
SECTION AT A.A.

Fig: 4.



SECTION AT D.D.

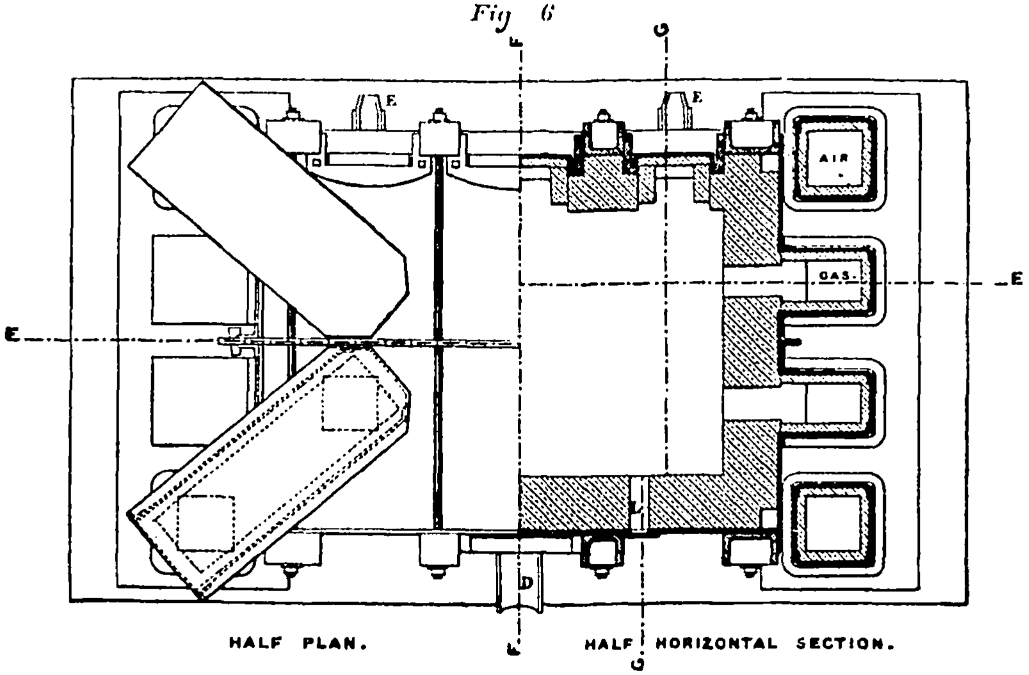
Fig: 5.



SECTION AT E.E.

of the magnesia and bauxite bricks they have been satisfactory, and, but for their great cost, magnesia bricks would doubtless be much better than silica bricks for the faces of the ports. The waste is not excessive; taking the more recent work, without charging or crediting skulls and pit-scrap, the results for the 106 casts are as follows :—Farnley pig, 90·4 tons; hæmatite pig, 0·675; iron and steel scrap, 130·15; ferro-manganese, 4·73—total, say 235 tons charged. The total weight produced, of ingots and spare metal, is 219·3 tons, or about 93 per cent. of the raw materials. About 9cwt. of raw dolomite per ton of ingots has been used for repairs of the furnace, as deduced from the work done during the year.

Fig 6



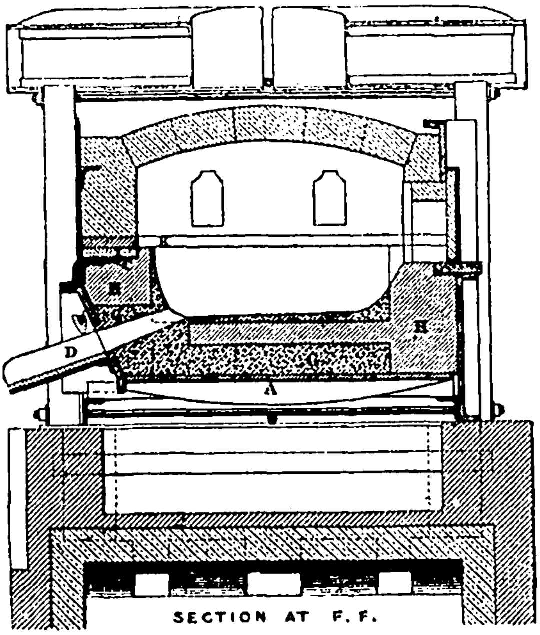
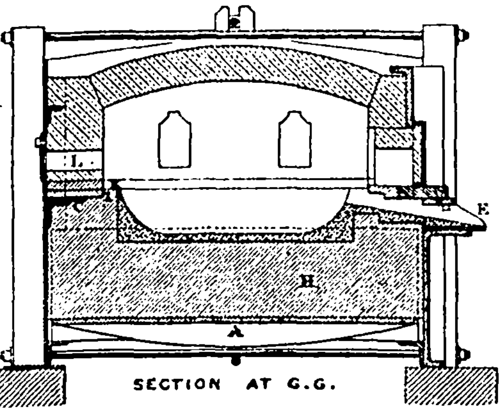


Fig. 7.

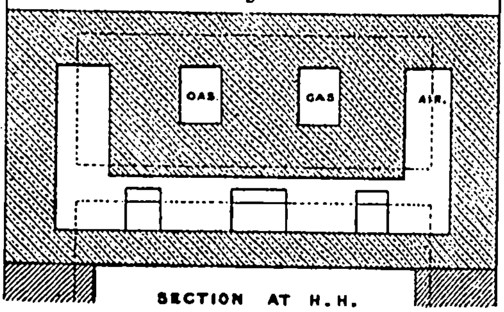
Fig : 8.



Numerous mechanical tests are given, the average breaking weight being 24·76 tons per square inch, with a minimum of 22·29, and a maximum of 26·68; average elongation on eight inches being 30·62 per cent., with a minimum of 25·0, and a maximum of 37·5. The order of removal of phosphorus is different from that in the Bessemer converter. In the latter process the phosphorus is not eliminated to any great extent until the carbon and silicon have almost disappeared; hence so little as 1·974 per cent. of phosphoric acid in the final slag was not expected. Another sample of slag, taken after the pig was fluid, but before the scraps were melted, was, however, found to contain 5·087 per cent.

of phosphoric acid. Samples of metal taken when the whole charge was melted, and before boiling commenced, have always been found to contain less phosphorus than the charge was known to contain, showing that the elimination of phosphorus commences in the early stages. Sulphur does not appear to be eliminated during the process. A sample of deposit from the gas-regenerator contained 4·741 per cent. of phosphoric acid; and another sample from the air-regenerator contained 2·995 per cent.; thus indicating that some of the phosphorus leaves the furnace otherwise than in the slags. The analyses were made by J. O. Arnold. The phosphorus was precipitated boiling by molybdate solution, and reprecipitated by magnesium mixture, giving results higher than are obtained by the molybdate method.—J. T.

Fig: 9.



SECTION AT H.H.

Variation in the Elasticity of Iron and Steel. Chem. Centr. **16**, 574—575.

It is a well-known fact that iron obtained by puddling and welding is not homogeneous throughout, and it has been shown that blocks of Bessemer steel have towards the centre a larger percentage of carbon, silicon, sulphur, phosphorus and manganese. In many works the homogeneity of the steel is tested by the change of colour produced by change of temperature. Kerpely has shown that a cast steel obtained by melting a cementation steel of greater hardness than the standard can only serve for this test, since the stirring of the molten mass by itself produces very little effect. By heating masses of heterogeneous iron and steel similar changes take place as in the cementation process, and in the method for producing tempered steel by heating cast iron with iron oxide. A kind of internal cementation goes on which, if sufficient time be allowed, must produce a metal of greater chemical uniformity. Fibrous iron, which has been exposed to a high temperature for some time, becomes more brittle but less hard, and acquires a crystalline fracture.—S. R.

Production of Lead, Silver, and Zinc in Germany during the Year 1884. Chem. Centr. **16**, 589—590.

PRODUCTION OF LEAD AND SILVER.

Localities.	Lead in Tons.				Silver in Kilos.	
	1884.		1883.		1884.	1883.
	Lead.	Litharge.	Lead.	Litharge.		
Prussia	68,150	2,158	65,731	2,312	121,724	111,991
Hannover	10,800	1,628	10,318	1,820	47,695	12,511
Nassau	9,373	121	8,111	415	11,390½	17,333
Saxony (Freiberg)	5,460	509	5,271	458	60,309½	58,916
Total	94,101	4,713	89,767	5,044	240,925	233,881
	98,814		94,811			

The total production of lead throughout the world is estimated as being between 450,000 and 500,000 tons annually. In 1884, Spain contributed 90,000 tons, and North America 139,897 tons.

PRODUCTION OF ZINC IN EUROPE.

Localities.	1884.	1883.
Rhine provinces and Westphalia	37,461	36,038
Silesia	76,238	71,466
Belgium	40,449	38,095
Altenberg Company	52,532	50,015
Asturisch Company	15,574	14,893
England	29,259	28,661
Austria	4,000	4,540
Poland	4,227	3,789
Total in Tons	259,740	247,505

—S. R.

Process for Electrolytic Extraction of Copper from its Ores. Eugenio Marchese, Genoa. Eng. Pat. 12,725, September 23, 1884,

A portion of the ore is smelted so as to form a matt, consisting generally of copper, iron and sulphur. This is cast into plates, to be employed as the anodes in the electrolytic baths, plates of copper being used as cathodes. Another portion of ore is roasted and lixiviated, sulphuric acid being added to dissolve the oxides. The resulting solution of the sulphates of copper and iron is charged into the electrolytic baths, where it is decomposed by the current. Metallic copper is deposited on the cathodes, and the sulphides of the anodes are dissolved. The electric current is obtained largely by the oxidation of the iron in the anodes. The spent anodes are used for the production of sulphur and sulphuric acid, and the sulphate of iron in the spent liquor is crystallised.—S. Y.

Process for the Recovery of Tin from Tinplate Scrap and other Materials containing Tin, such as Oxidised Metal and Residues. Herbert John Haddan, Strand, Westminster. From Alfred Lambotte, Brussels. Eng. Pat. 14,672, November 6, 1884.

The matter to be treated is subjected in suitable chambers to the action of chlorine gas, largely diluted with air, and heated to a temperature above the boiling point of stannic chloride. The chloride formed is suitably condensed, either by injecting steam into the gases as they leave these chambers, and collecting the crystals in condensation chambers (the dry gases may, if preferred, be led into the condensation chambers, the walls of which must then be kept moist), or by absorbing it in a solution of stannic chloride. The evaporation of the concentrated solution may be conducted without risk of decomposition by passing through it a current of warm air. Dilute chlorine, yielded in certain chemical processes, is available for this method of treatment.

—W. G. M.

A Process for Producing Aluminium from Chloride of Aluminium (Al_2Cl_6). Hector von Grousilliers, Springe, Hanover. Eng. Pat. 7858, June 29, 1885.

In order to avoid the difficulties ordinarily met with in the use of aluminium-sodium-chloride to obtain metallic aluminium, the patentee raises the volatilising point of the simple chloride by performing the reduction, either chemical or electrolytic, under pressure in a strong hermetically closed vessel, lined with clay or magnesia, and provided with a safety valve.—W. G. M.

Improvements in Metallurgical Furnaces. John Thomson King, Liverpool. From Samuel Thomas Owens, Pittsburg, U.S. Eng. Pat. 8478, July 14, 1885.

This is a form of regenerative furnace, in which the heated products of combustion pass continuously in the same direction through clay pipes, supported at the joints, and laid in a chamber beneath the furnace. The air to be employed in combustion is heated by passing between these pipes into a long arched space above them; thence it flows to the fire bridge. The gas is supplied through a series of nozzles placed on a level with the top of the bridge; it may be warm, as supplied direct from the producer, or be heated by traversing pipes placed in the air space above the flue pipes already described.—W. G. M.

Improvements in Apparatus for Refining Copper and other Metallic Mattes by Electrolytic and Chemical Actions. W. Wood and M. H. Hurrell, London. Eng. Pat. 8661, July 17, 1885.

Improvements in apparatus for refining by electrolytic and chemical action copper and other mattes of metals, which are with difficulty, if at all, separated by the process of fusion. In a main tank, porous cells, containing the matte cast in the form of anodes, together with the cathode plates, are arranged so as to secure the upward and downward flow over their surfaces of the electrolytic solutions. There is an elevated supply tank, with distributing pipes, for supplying the solution to the main tank, and an arrangement by means of which the weak solution from the main tank is conveyed to the porous cells, and the strong solution away from the lower part of the porous cells. A chemical precipitating tank, fitted with plates, is also arranged so as to secure an upward and downward flow of the solution, and to return it from the precipitating tank to the elevated tank. A pump for raising the solution to the elevated supply tank is set in motion and stopped by the action of the return solution.—T.

Improvements in and Relating to the Purity of Iron and Steel. William Robert Lake, London. From William Henry Purdy, Brooklyn, U.S. Eng. Pat. 8819, July 21, 1885.

The interior of the melting vessel is lined to the depth of one quarter of an inch (or the metal itself may be painted before fusion) with a mixture of minium (1lb.), litharge (1lb.), cinnabar (¼lb.), and moulding sand or loam (3lb.), with one gallon of water. The basic nature of this mixture causes it to exert a purifying action on the melted iron; whilst the excess of the oxygen of the minium removes a portion of the carbon.

—W. G. M.

XI.—FATS, OILS, AND SOAP MANUFACTURE.

Adulteration of Olive Oil. Arch. Pharm. **3**, 23, 280.

The various oils commonly employed for the adulteration of olive oil may be detected as follows:—

Linseed Oil.—2cc. nitric acid are mixed with 5cc. of the sample, and a piece of bright copper wire introduced into the mixture. If after half-an-hour the wire has acquired a rose colour the olive oil contained linseed oil as an adulterant.

Cotton-seed Oil.—The olive oil is mixed with an equal quantity of nitric acid (40° B.). A brown colouration indicates the presence of cotton-seed oil.

Sesame Oil.—An equal quantity of hydrochloric acid (23° B.) is added, and a fragment of cane-sugar dissolved in the mixture. If after shaking and standing a red colour is developed, sesame oil is present.

Colza Oil.—10grm. of the oil is saponified with an alcoholic solution of caustic potash (free from sulphur); a darkening in colour shows that colza oil has been added.

Earth-nut Oil.—The oil is saponified with alcoholic potash solution, and the soap when separated is warmed to remove the alcohol. It is then decomposed with hydrochloric acid, and the liberated fatty acids dissolved in boiling alcohol. If the oil has been adulterated, arachidic acid will now separate out. It can be recognised by its mother of pearl lustre.—S. R.

Determination of the Sp. Gr. of Butter and Tallow at 100° Wolckenhaar. Rep. Anal. Chem. **5**, 236.

The author has determined the sp. gr. of these fats by means of an areometer, and has compared the indications of the instrument with the numbers obtained by weighing a standard sinker, immersed in molten fat. The results were not concordant, and established a serious but nearly constant discrepancy between the true sp. gr. and the areometer readings; this is shown by the following numbers (mean of six determinations, probable error <0·003):—

	By Areometer. sp. gr.	By the Balance. sp. gr.
Butter	0·868	0 9025
Tallow	0·860	0·8938

—C. F. C.

Chemical Action of Soaps. Professor Rotondi, of the Royal Industrial Museum of Turin. Chem. Rev. **14**, 228.

The author rejects the theory of Berzelius, that the usefulness of soaps depends upon the facility with which neutral soaps decompose on solution into acid soaps and free alkali, and also that of Persoz, who assumes neutral soaps to be soluble in hot water without decomposition, but to be resolved in cold water into acid and basic soaps—the latter dissolving fatty substances by saponification. These hypotheses do not explain why hot soap solutions are more active than cold ones. The following conclusions were arrived at by the author from experiments upon carefully purified Marseilles soap. Neutral soaps on solution are decomposed into basic and acid soaps, the latter are insoluble in cold, and only slightly soluble in hot water; they are not dialysable, and so are thus separable from the former, which are readily so. The neutral soaps, though thus decomposed, lose neither free nor carbonated alkali. Basic soaps are completely soluble in cold and hot water, and are entirely precipitated by sodium chloride without loss of alkali; their solutions dissolve acid soaps on heating, but become turbid on cooling. They emulsify fatty bodies readily, but no saponification of the latter takes place; neutral soaps possess this property to a smaller extent, acid soaps scarcely at all. Carbonic acid produces in cold solutions of basic soaps insoluble compounds, which, however, disappear on heating, hence waters rich in carbonic acid are not suited for industrial operations with soap. The above explains the greater efficiency of hot soap solutions, and bears importantly upon the manufacture and industrial uses of soap, inasmuch as different results are often observed in the use of soaps made from the same materials (and containing no free alkali), due to their containing variable amounts of acid and basic soaps. The author considers that soaps should consist as nearly as possible of neutral compounds, citing instances of danger attendant upon the presence of an excess of basic soap—*e.g.*, in the boiling of silks. These are facts to be borne in mind in the operations of soap-boiling, as well as in soap analysis when it is desired to ascertain the fitness of a sample for a given purpose.—E. E. B.

A New or Improved Method of, and Apparatus for the Emulsion of two Substances of Dissimilar Specific Gravity. E. G. Brewer, of London. From Burmeister and Wain's Maskin and Skibsbyggeri, Copenhagen. Eng. Pat. 11,907, September 2, 1884.

THIS invention consists in the employment of centrifugal-power machines for the production of the emulsion of some fatty substance in milk; this may be effected either with or without the simultaneous separation of cream from the milk. The fat-delivery pipes are usually led from a small reservoir arranged on the centrifugal spindle, and when the latter rotates, the fat is driven in fine streams into the milk. In some cases, however, the fat-delivery tube is stationary, and adjustable in the cover of the centrifugal reservoir, in which case its opening is more or less bent. Drawings of these various openings are given. The claim is very elaborate, and is summed up in 13 heads.—W. L. C.

Improvement in the Manufacture of Soap. Clem. Harrison, East Dulwich. Eng. Pat. 12,841, September 26, 1884.

To increase the detergent qualities of soap, turps, ammonia, and pearlash, in suitable proportions (none are given) with or without the addition of methylated spirit, are incorporated either with soap, or with fats and oils prior to their saponification.—W. L. C.

A New or Improved Process for Obtaining useful Products from the Yolk or Grease of Wool. W. H. Beck. From C. Viollette, of Lille, and A. Vinchon, of Roubaix. Eng. Pat. 13,815, October 18, 1884.

THE perfectly dried yolk is heated in a boiler to 250° or 300° (whether C. or F. is not stated) for some hours with one-fourth its weight of solid caustic soda, the mass being agitated by mechanical stirrers. The free fatty acids are thus saponified, and the neutral ethers are decomposed; the alcohols also are transformed into their corresponding acids, for example cerylic alcohol into cerotic acid. When the reactions are completed the mass is treated with three or four times its weight of boiling water, after which the soda solution thus formed is concentrated and calcined, while the soaps are decomposed with a mineral acid, and the resulting fatty acids, which are specially waxy in character, are distilled in superheated steam. Soda-lime, or potash-lime, may be substituted for the caustic soda. It is claimed that the solid fatty acids are more than 50 per cent. of the primary material employed, and that the process resolves satisfactorily the question of the purification of wash waters from wool.—W. L. C.

Improvements in the Process of Manufacturing Railway Axle-, or other Grease, and in Plant or Apparatus applicable therefor. M. W. Hydes and J. H. Williams. Eng. Pat., December 16, 1884.

THIS contains solely the description of a jacketed pan, graduated to show the contents at a given height, fitted with superheated and ordinary steam, run-off cocks, reservoirs, etc. To render control of the operations easy, the cocks of the various pipes are all brought to one dial plate. A drawing is given, but no process of manufacture is described.—W. L. C.

An Improved Compound for Cleansing Wool and other Fibres, Cloth, and other Fabrics. James Hanford, Leeds. Eng. Pat. 7004, June 9, 1885.

LARD, resin, and American potash are incorporated and allowed to stand for some days, after which silicate of soda, soda-ash, soft soap, Irish moss, and farina, are added; the whole is boiled for two hours, and after straining and cooling is ready for use. The proportions of ingredients necessary for 25cwt. of the compound are named.—W. L. C.

XIII.—TANNING, LEATHER, GLUE, AND SIZE.

A Blackening for Leather Articles. Chem. Centr.-Blatt. **16**, 543.

THE following receipt gives a black which will take a good polish, and can be used for any kind of leather:—To 3lb. of boiling water are added ½lb. of white wax, 1oz. transparent gelatine, 2oz. gum senegal, 1½oz. white soap, and 2oz. brown sugar; when the mixture is cold 2½oz. of alcohol and 3oz. of Frankfort black are added. It is applied to the leather with a soft brush, and when dry the leather is rubbed with pumice stone and finally polished.—S. R.

XIV.—AGRICULTURE, MANURES, Etc.

On the Yield of Alkaloids from Different Species and Varieties of Lupin. E. Hiller (Landwirthsch, Vers.-Stat. **31**, 336—341).

THE following table contains the results of analyses by the author, and by E. Täuber (*Ibid.* 29, 451):—

	E. HILLER.			E. TAUBER.		
	Total Alkaloids.	Liquid Alkaloids.	Solid Alkaloids.	Total Alkaloids.	Liquid Alkaloids.	Solid Alkaloids.
Lupinus luteus	0·65	0·32	0·33	0·81	0·39	0·12
Yellow flowering lupin (bastard)	0·55	0·32	0·23	0·70	0·29	0·41
Lupinus albus	0·15	0·025	0·125	0·51	0·08	0·13
„ termis	0·35	0·032	0·318	0·39	0·03	0·36
White flowering lupin with large seeds	0·27	0·017	0·253	0·27	0·015	0·255
Lupinus linifolius	0·21	0·027	0·213	0·32	0·02	0·30
Blue flowering lupin with white seed	0·23	0·029	0·200	0·37	0·02	0·35
Blue lupin	0·21	0·021	0·186	0·29	0·05	0·21
Lupinus augustifolius	0·21	0·011	0·196	0·25	0·03	0·22
„ hirsutus	0·01	—	0·010	0·02	—	0·02

—S. Y.

Soils and Peats from the Baltic Region. Prof. G. Thoms, Baltisch. Wochenschr. 1883-4, Bied. Centr. **13**, 1884, 410.

THIRTY-NINE samples (of loam, marl, and other soils) contained proportions of phosphoric acid ranging from

0·02 per cent. to 0·19 per cent., the mean being 0·0763 per cent. Thirty-six samples of moorland soil were found to contain the following proportions of mineral matter, nitrogen, potash, and phosphoric acid :—

	Mineral Matter.	In the Ash.		In the Dried Soil.		
		Potash.	Phosphoric Acid.	Potash.	Phosphoric Acid.	Nitrogen.
Maximum	32·87	0·89	1·03	0·1602	0·5671	5·81
Minimum	0·95	0·17	1·28	0·0010	0·0225	0·86
Mean	7·62	0·31	2·02	0·0370	0·1115	2·36

—E. G. C.

A Sample of Cave Earth. Prof. J. König. Bied. Centr. 13, 410.

This earth came from a cavern in the neighbourhood of Clusenstein, and contained bones, greatly weathered, together with large stones. The composition of the sample was as follows :—

	Cave Earth.	Bones Therein.	White Stones Therein.
Water	15·51	11·88	31·07
Organic matter	3·02	9·66	0·91
Nitrogen....................	small quantity	1·19	—
Mineral matter	81·17	78·16	67·99
In latter :—			0·19
Phosphoric acid	4·21	25·16	
Lime	4·76	31·00	38·16
Equivalent to :—			1·07
Calcium phosphate	9·26	51·92	
Calcium carbonate	—	2·35	66·80

—E. G. C.

Treatment of Human Excreta for Manurial Purposes. K. Engler. Bied. Centr. 13, 411.

According to the process of Buhl and Keller, carried out in Freiburg, ammonia is separated from the sewage by distillation with milk of lime, and the solid matters are precipitated by a manganese solution. The "poudrette" contains from 2·1 to 3·0 per cent. of nitrogen (calculated on the dry substance), while 1,000 parts of the waste water contain from 12½ to 15½ parts of solid matter, of which from 3·2 to 4·7 parts are lost on ignition, together with 0·2 part of ammonia. This waste water is allowed to run into pits, but no indications of contamination of the water of neighbouring wells have yet been observed.

—E. G. C.

A New Cattle Food. H. Gilbert. Bied. Centr. 13, 1884.

This article was sold under the names of "strength food," and "palm-nut meal," and it was found by the author to consist of 12 per cent. of common salt, and 88 per cent. of vegetable ivory turnings. These were a waste product from the manufacture of buttons, and their nutritive value was very trifling, because of their horny character. The results of the analysis were as follows :—

		Control-analysis of some v. i. turnings.
Fat	1·05	1·02
Proteïds	4·19	4·81
Ash (including 11·51% of salt)	13·61	1·46
Woody fibre	10·33	13·61
Water......................................	9·20	10·50
Non-nitrogenous extractive matter	61·37	68·60
	100·00	100·60

This cattle food was not pulverulent, like palm-nut meal, but contained little white and brown particles, which could be separated from the salt by treatment with water. The nuts known as vegetable ivory come from a kind of palm *(phytelephas macrocarpa)*, and are imported from Columbia and Ecuador. Dr. J. Moeller states that the horny matter of which these nuts are composed consists of a peculiar modification of cellular tissue, scarcely to be distinguished from pure cellulose. Other examples of this compact horny structure are to be found in the date-stone and the coffee-berry.—E. G. C.

The Manuring of Hops. E. Pott. Bied. Centr. 13, 412.

The author considers that the manures commonly used, such as stable-manure, refuse from latrines, etc., have a tendency to increase the quantity of hops yielded, at the expense of their quality. Hops should not be over-manured, and manures rich in nitrogen should be especially avoided. From 3 to 6kilos. of bone meal, with 1½ to 2kilos. of Chili saltpetre, to the square metre, in soils poor in phosphoric acid, or from 6 to 15kilos. of crude potassium chloride, with or without Chili saltpetre, on land poor in potash, would furnish satisfactory results.—E. G. C.

Bavarian Peat. Th. Schreiber. Bied. Centr. 13, 418.

The results of analyses of 27 samples of Bavarian peat are given in this paper, the percentage proportions of fibre, dust, mineral and organic matter, and nitrogen, being stated. It appears that Bavarian peat is richer in nitrogen than North German peat.—E. G. C.

On the Absorption of Nitrogen by the Leguminosæ. Boutellau. Bied. Centr. **13**, 420.

A PLOT of land, previously a vineyard, was manured with 800 to 900kilos. of superphosphate, and sown with oats in the autumn. In the following spring, the field received a top-dressing of 150kilos. of Chili saltpetre, and was then sown with lucerne and esparsette, among the grain: 45 hectolitres of the latter were reaped in August. In the next autumn the plot was treated with 800 to 900kilos. of a manure containing 14 per cent. of potash and 6 per cent. of phosphoric acid, which was exclusively employed during the following year. The yield of dry fodder from the three annual reapings amounted to 14–15,000kilos. From whence did these considerable crops derive their nitrogen? For, the author observes, the one manuring with Chili saltpetre was absorbed by the crop of grain, other experiments having shown that the soil was not in a condition, without manuring with nitrogen, to yield good grain crops; and yet the leguminosæ flourished well. Another field was treated with 35,000kilos. of stable-manure, and then planted, one-third with potatoes, one-third with maize, and one-third with vetches. Next year the whole field was sown with wheat, the portion where potatoes had grown yielded 30 hectolitres, the plot previously covered with maize yielded 28 hectolitres, and the part where the vetches had been furnished 35 hectolitres. The vetches contained more nitrogen than the maize, and yet the wheat crop was more abundant after the vetches than after the maize.—E. G. C.

On the Separation of Oxygen in the Leaves of the Crassulaceæ. Adolph Mayer. Bied. Centr. **13**, 422.

SOME previous investigations of the author appeared to indicate that leaves of the crassulaceæ, exposed to the light in an atmosphere free from carbonic anhydride, separate oxygen gas, and lose their acidity. This acidity was considered by the author to be due to a modification of malic acid, called by him iso-malic acid, and which he thought might be converted, by a process of reduction, into a carbohydrate. The results of further experiments have served to support the accuracy of these conclusions, an increase in saccharine and starchy matter having been observed by A. Mayer in the leaves after exposure.

—E. G. C.

On some Points in the Composition of Soils, with Results illustrating the Sources of Fertility of Manitoba Prairie Soils. J. B. Lawes and J. H. Gilbert. J. Chem. Soc. (Trans.) 1885, 380—422.

THE present communication is a continuation of a previous paper relating to the sources of nitrogen of our crops (*J. Chem. Soc.* (abstr.), 1884, 682—691), wherein are set forth and discussed the results of the determinations of nitrogen in various experimental crops, and in the upper layers of the soil upon which they were cultivated. In that paper the authors show, amongst other things, that the annual yield of nitrogen is least in cereals, greater in roots, and still greater in leguminous crops, whilst with rotation, when roots and leguminous crops are interpolated with cereals, the yield is greater than with cereals continuously grown; but whenever the same crop is grown year after year on the same land without manure, or with mineral (non-nitrogenous) manure only, in all cases, and with all crops on arable land, there is a great decrease in the annual yield of nitrogen, and in most cases this is accompanied by a simultaneous decline in the quantity of nitrogen in the surface soil. This is especially evident in cereal and root crops; in fact, almost all their nitrogen may be traced to the deficit in the soil. With leguminosæ grown occasionally on arable soil, however, the reverse is sometimes the case, and the surface soil is found richer in nitrogen after, than it was before the crop was grown; hence, cereals thrive well on land after clover. But experiments with leguminosæ grown continuously on the same garden soil, indicate that they follow the above rule, and each successive year the nitrogen, both in soil and in crop, becomes less; in fact, almost all the nitrogen in the crop can be accounted for by the loss of nitrogen in the first eighteen inches of soil, and the small quantity supplied in rain, etc. Mixed herbage on permanent grass land yields more nitrogen per acre per annum when manured with mineral (non-nitrogenous) manure, than when it receives no manure, and this increase is found to be more than counterbalanced by a loss of nitrogen in the soil. Strong, deeply-rooted plants (*melilotus leucantha*) have yielded large quantities of nitrogen, when similar but weaker plants (*trifolium repens*) have failed to thrive, the soil was found much less moist in the former than in the latter case. Taking these facts into consideration, coupled with the fact, as the authors point out, that the quantity of combined nitrogen supplied from the atmosphere in rain, dew, and all other forms is quite inadequate for the requirements of plants; and as, moreover, the balance of experimental evidence is against the supposition that plants assimilate free nitrogen from the atmosphere, they conclude that the store of nitrogen in the soil is the source of at least most of the nitrogen in the plants. Whilst in this and other papers it is shown that much of the nitrogen derived from the soil is taken up as nitrate.

These investigations have now been extended to other soils and to sub-soils; the above results relating principally to surface soils. Towards the end of July, 1883, after the crops were removed, soil samples were taken to the depth of twelve times nine inches, from plots of common vetch (*vicia sativa*) from plots of white clover (*trifolium repens*), and from wheat and fallow land, which had been fallow since the previous harvest. These plots were all *in the same field, quite close together*. A fairly luxuriant crop has been taken off the vetch plots, but there was no plant at all on the white clover plot. The results of the determination of nitrogen as *nitric acid in the various samples are tabulated below*, the figures being pounds per acre:—

Depths.	Unmanured Wheat and Fallow Land.	Mineral (non-nitrogenous) Manure.		
		Trifolium repens. Plot 4.	*Vicia sativa.*	
			Plot 4.	Plot 6.
Inches. 1—9	19·85	30·90	12·16	10·22
10—18	8·05	27·73	4·11	2·72
19—27	2·17	8·41	1·37	1·08
28—36	2·70	7·61	1·67	1·52
37—45	1·62	9·07	4·58	2·51
46—54	3·57	8·77	6·37	1·12
55—63	3·81	7·92	7·16	1·52
64—72	2·28	8·31	5·95	4·92
73—81	1·48	8·27	4·51	4·81
82—90	1·76!	9·95	5·32	5·11
91—99	2·91	9·16	5·66	6·10
100—108	1·81	9·51	5·32	6·16
1—108	52·40	145·70	61·21	51·72

Comparing the wheat-land fallow plot with the *trifolium repens* plot, which was practically fallow, there is a remarkable difference in the amounts of nitrogen as nitric acid. Looking to the previous history, the one had grown wheat alternately with fallow for more than thirty years, and the other, during the same period, had grown six gramineous crops, been frequently fallow, but had been sown twelve times with red clover, and during the immediately preceding six years four times with white clover. Thus, irrespective of the, for the present purpose, unimportant dressing with mineral manure *in the one case and not in the* other, the whole difference had been the introduction of leguminous crops on the one, and not on the other, with the result that there is nearly three times as much nitrogen as nitric acid found in that soil, to the depth of 108 inches, as in the other to a corresponding depth. It is hence inferred that nitrification is more active under the influence of leguminous than of gramineous growth and crop residue. Sub-soils have been found to contain no nitrifying organisms (Warington, *J. Chem. Soc.* (Trans.), 1884, 637); but from other experiments the authors have shown that the nitrogen of sub-soil, when subjected to suitable conditions, is capable of nitrification. The beneficial influence of leguminous growth is shown at a great depth, with strong, deep-rooted *melilotus leucantha*, for the channels made by its roots and by worms, would allow the nitrifying organism to pass down along with other substances, whilst owing to the large quantity of water drawn up (see above), air, water, etc., must necessarily pass down. Therefore, upon this supposition the greater the root development the greater would be the amount of nitric acid formed, and of nitrogen rendered available in this form to the plant from the sub-soil. If established this would go far to explain the large amounts of nitrogen yielded by these deep-rooted leguminous crops over a given area; and would, moreover, account for the fact that where a crop of a certain root-range has failed, having exhausted its store of suitable nitrogenous matter, a plant of another root-range thrives. Thus *melilotus leucantha*, *vicia sativa*, and *medicago sativa* succeeded where red clover failed, and clover throve where beans had failed. Hence, in explanation, it is suggested, supposing a healthy leguminous plant is established, whether its growth, excretions, and residue do not exert a favourable influence on the development of the nitrifying organism, at first in the rich upper, subsequently in the poorer lower layers of the soil, and thus gradually render the organic nitrogen of the soil and sub-soil available for the requirements of growth; consequently there is a large crop, and a large crop residue, which enriches the surface soil. But this explanation requires proof. With regard to the assimilation of nitrogen in organic combination from the soil, by green-leaved plants, it is pointed out that there is no direct evidence in favour of such a view, whilst there are physiological considerations which seem to be against it. On the other hand the assimilation of nitric acid is evident from the above table, when the quantities of nitrogen as nitric acid found in the *trifolium repens* plot, where there was no plant to take it up, is compared with the nitrogen as nitric acid in the *vicia* plots, where there was plenty of growth to utilise the nitric acid formed; so great is the difference that the nitrogen deficit in the *vicia* plots is sufficient to account for a large proportion of the nitrogen contained in the *vetch* crop. Other experiments are described, which likewise bear indirectly on this point, and are accordant, but which more directly illustrate the loss of nitrogen, which may result from leaving land fallow during a wet season; it is hence deemed advisable to keep land covered with a crop to take up the nitrate as it is produced. In concluding this part of the paper the authors regard as established that a considerable quantity of the nitrogen of plants is derived from the stores in the soil, and that much, and in some cases the whole, of this nitrogen is taken up as nitrate.

From the above suggestions it would seem that a soil containing sufficient available mineral constituents, and a large proportion of nitrogen, which is readily nitrified, may be regarded as fertile; and, therefore, virgin prairie soils should fulfil these conditions. To test this point the following investigations were made with Manitoba prairie soils, which are not deficient in mineral matter. Surface soils, from Portage la Prairie, which had been under cultivation several years, from the Saskatchewan district also under cultivation some time, and from Fort Ellice, virgin soil, contained respectively 0·2471, 0·3027, 0·2500 per cent. of nitrogen, and are twice as rich in nitrogen as the average arable soil in Great Britain, and perhaps about as rich as the average of the surface soils of permanent pasture land. Four other Manitoba soils were more thoroughly examined, and experiments were conducted to ascertain the susceptibility to nitrification of the nitrogen in them. The soils were (1) from Niverville, about 44 miles west of Winnipeg; had been broken from the prairie five or six years, and had grown five crops of cereals. (2) From Brandon, about 132 miles west of Winnipeg; had been broken up in 1882, back set in 1883, and grew 25 bushels of wheat per acre that year. (3) From Selkirk, which had never been broken up. (4) From Winnipeg; broken up about five years; had been thoroughly cultivated, and manured, and had grown good crops of potatoes. There were four samples of each of these soils investigated, representing the first, second, third and fourth 12 inches from the surface. For the nitrification experiments the samples were extracted with water on a vacuum pump, the nitrogen as nitric acid estimated in the extract, and the extracted soils were broken up, exposed to the air in shallow vessels in a moist condition, and at a suitable temperature, being covered loosely with glass plates to protect them from dust; at the end of periods of about twenty-eight days or more the samples were again extracted, the nitrogen as nitric acid determined in the extract, and the extracted masses exposed as before. After the fourth extraction, potassium phosphate, magnesium sulphate and calcium carbonate were added to the samples to replace the mineral matter removed by the repeated extractions, as it might be that the reduction of nitrification noticed at that period was due to the want of mineral matters necessary for the development of the nitrifying organism; whilst after the seventh period some of the less active samples were seeded with 0·1grm. of rich garden mould. The results are given in table on p. 606. The first column of results shows the total quantity of nitrogen, whilst the following columns indicate the condition of the nitrogen, or its nitrifiability and usefulness to plant life. When it is remembered that the percentage of nitrogen in the dry arable soils at Rothamsted, in the first 9 inches, seldom exceeds 0·14 or 0·15, and is sometimes as low as 0·10; in the second 9 inches it ranges from 0·07 to slightly more than 0·08; in third 9 inches from below 0·06 to about 0·07, whilst in the lower depths it is still less, it will appear that these Manitoba soils are undoubtedly very fertile, and may be compared to the surface soil of old pasture land at Rothamsted, which contains from 0·25 to 0·30 per cent. of nitrogen. The second column of results relates to the amount of nitrogen as nitric acid found in the samples, at the commencement of the experiments, and are naturally irregular, owing to the different conditions of the samples, as to moisture, etc. The third and subsequent columns of results show the progress of nitrification. It will be seen that in each set of soils the nitrification is greater in the richer surface soils than it is in the poorer sub-soils, and generally, but not uniformly, greater in the second than in the third, and in the third than in the fourth depth of 12 inches. When the activity began to diminish at the fourth period, the mineral matter was added to all the samples, but without improving matters, owing at first to the quantity added being too great; but even in a subsequent extraction (7th period) the production of nitric nitrogen was still very small, and therefore the garden soil was added as already stated, with the result indicated in the last column, where the amount of nitrogen nitrified shows a considerable increase over that of the seventh period. The percentage of the original nitrogen nitrified throughout the experiment up to the end of the eighth period, was, in each case, as follows:—

	Niverville.	Brandon.	Selkirk.	Winnipeg.
1st depth	3·21*	4·78	3·77	5·42
2nd „	1·26	1·61*	4·18	3·35
3rd „	0·51	2·07	1·00	4·85
4th „	1·00	1·22	0·77	2·78

It is remarked that the conditions of these experiments cannot be compared with those of the soils in their actual conditions of aeration, moisture and temperature; nevertheless, the results are very important, showing, if the sub-soils are really pure, that the nitrogenous matter of sub-soils is liable to nitrification when the conditions are suitable for such a change to take place. This susceptibility of the nitrogen to oxidation may be a source of loss, if there is no crop to take up the nitrates when formed. In spite of the great richness of these soils, they do not produce as much wheat per acre per annum as is obtained in Great Britain; this is owing, in part, to unfavourable climatic influences, and short seasons of growth, but more largely to scarcity of labour, and consequently bad cultivation. A table is given comparing the percentage of nitrogen and carbon in various soils of known history—Rothamsted arable and grass soils, arable soils in Great Britain, United States (Illinois) and Canadian prairie soils, and rich Russian soils, from which it seems that the rich virgin soils, or permanent pasture surface soils, contain a high percentage of nitrogen and of carbon, and a high relation of carbon to nitrogen. *An arable soil which has long been under cultivation*, is much poorer in these respects; whilst an agriculturally-exhausted arable soil shows very low percentages of nitrogen and carbon, and a very low relation *of carbon to nitrogen. A fertile soil may then be defined* in the words of the authors, as one "which has accumulated within it the residue of ages of previous vegetation, and that it becomes unfertile as this residue is exhausted." The paper *terminates with a copious summary and the* conclusions of the authors.—D. A. L.

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* Too low.

Depths.	Per cent. Nitrogen in Dry Soil.	Nitrogen as Nitric Acid per Million Dry Soil.										
		Original.	Periods of Exposure.									
			1st.: 28 days.	2nd.: 28 days.	3rd.		4th.		5th. & 6th: 79 days.	7th.: 28 days.	8th.	
					No. of days.		No. of days.				No. of days.	
				Soil from Nivcrville.								
1st.	0·261	2·70	11·33	0·14	87	45·75	35	lost.	0·14	4·65	49	0·32
2nd.	0·169	0·18	3·13	3·23	85	1·89	38	4·14	3·11	0·57	28	(6·66)
3rd.	0·069	0·62	0·38†	0·35	82	0·31	38	0·11	0·78	0·21	28	(1·28)
4th.	0·038	0·71	0·11	0·59	71	0·51	38	0·29	1·10	0·18	28	(0·63)
				Soil from Brandon.								
1st.	0·187	0·23	9·13	8·82	87	33·55	35	12·51	10·15	6·91	49	8·31
2nd.	0·109	1·50	1·43*	1·05	85	3·27	35	5·70	4·03	2·37	49	lost.
3rd.	0·072	0·75	4·56†	3·81	82	1·05	38	1·71	0·79	0·21	28	(2·75)
4th.	0·019	1·10	0·52*	0·28	74	0·18	38	0·09	0·11	0·16	28	(0·67)
				Soil from Selkirk.								
1st.	0·618	3·91	48·13	31·77	87	58·83	35	21·90	28·23	21·73	49	17·39
2nd.	0·261	3·08	13·67*	22·71	77	26·61	35	11·30	11·98	13·61	49	15·06
3rd.	0·076	0·52	0·99	1·86	71	1·08	35	0·15	0·78	0·27	28	(2·10)
4th.	0·012	0·31	0·19	0·22	62	0·77	38	0·35	0·83	0·23	28	(0·69)
				Soil from Winnipeg.								
1st.	0·128	132·37	38·09	28·85	88	57·75	35	35·03	22·05	21·23	49	28·26
2nd.	0·327	83·19	5·95*	21·75	85	21·27	38	17·97	21·79	3·95	49	17·71
3rd.	0·158	36·02	12·40	17·61	77	7·91	40	12·02	10·88	2·11	28	(13·63)
4th.	0·107	11·52	5·70	8·16	57	0·72	45	4·03	0·25	0·55	28	(10·11)

Results marked thus * are too low. Those marked thus † are after 26 days, and those in brackets ( ) are 28 days after adding the garden soil.

On the Influence of "Nitrate of Soda" and ordinary Saltpetre on Potatoes. P. Dehérain. Bied. Centr. **13**, 424.

According to experiments made by Elder, at Gingenött, a better yield of potatoes is obtained when potassium nitrate is used than when sodium nitrate is employed. The author, having repeated these experiments has not remarked this difference, and has arrived at the conclusion that nitrate of sodium in the soil is changed into potassium nitrate, and that only the latter is assimilated by the plants. A difference between the action of the two salts is only observed in those soils in which there is a deficiency of potassium, and in which, therefore, conversion of the sodium salt into the potassium salt cannot take place. An instance of this conversion is furnished by the author, who states that although the ash of some beans, which, before incineration, had been immersed in solutions of common salt contained 11·2 per cent. of chlorine, no sodium, but on the contrary, abundance of potassium was found.

—E. G. C.

XV.—SUGAR, GUMS, STARCHES, Etc.

Microbes in the Filters of Sugar Refineries. T. Mendes. Ztschr. d. Ver. f. Rüben. Zuckerind. **22**, 396—406.

The sugar-water from the refinery filter occasionally becomes turbid and of a pale yellow-white colour. A sample of this water had a smell of sour milk, became acid, and gave a precipitate with ammonia of calcium phosphate and carbonate, and eventually turned black. From a microscopic examination of the weak syrup and sugar-water from several sugar factories at

different periods the author finds that in all cases the turbidity is due to the same microbe, which is recognised by its bacillus-like form. The germs of this bacillus do not lose their vitality even at the temperature of boiling water. The original paper is accompanied with figures.
—S. R.

On Some Reactions of Saccharin. P. Herrmann and B. Tollens. Ber. **18**, 1333.

It has been shown by Tollens and others that true carbohydrates when boiled with dilute mineral acids yield levulinic or β-acetopropionic acid, while other substances of similar composition, such as methylenitone and inosite, do not yield this acid, and Kent and Tollens have suggested that the production of levulinic acid from a vegetable matter is a proof that it is a carbohydrate.

Saccharin, which has the same composition as starch, but a different constitution, was boiled with hydrochloric acid for twenty hours, but the greater part of the saccharine remained unaltered, and the presence of levulinic acid could not be recognised. The substance is therefore not a true carbohydrate.

It has been suggested by Kiliani and by Liebermann and Scheibler that saccharin is the lactone of saccharic acid, the latter being a substitution product of lactic acid.

A concentrated solution of saccharin when treated with potassium iodide solution and sodium hydrate yielded considerable quantities of iodoform, hence it is almost certain that the substance contains a methyl group.

Lactic acid was also prepared from saccharin by heating the substance with an aqueous solution of potassium hydrate, and allowing the temperature to rise gradually to 220°. (At a higher temperature lactic acid is decomposed with formation of oxalic acid.) The authors conclude that saccharin is an intermediate product between dextrose and lactic acid, and that it is the lactone of a lactic acid in which hydrogen is replaced by the group $-\mathrm{CH.OH}-\mathrm{CH.OH}-\mathrm{CH_2.OH}$.—S. Y.

On the Waste Waters from Sugar Factories. W. Demel. Bied. Centr. **13**, 361.

The author has analysed the waste waters from various sugar works. One series of results obtained by him is embodied in the following table :—

No.		Parts in 1000,000.					
		Loss on Ignition.	Non-volatile residue.	Total solid matter.	Ammonia.	Value of Permanganate required for Oxidation of Organic substances.	Reaction.
1	Suspended	31·52	501·01	538·53	—	—	—
	Dissolved	16·01	12·02	28·06	2·13	20·01	Neutral.
	Total	50·56	516·03	566·59	—	—	—
2	Dissolved	380·09	2736·00	3116·09	1·82	196·62	Acid.
3	Dissolved	1130·07	427·50	1557·57	0·44	3706·15	Basic.
4	Suspended	8·62	58·22	66·81	—	—	—
	Dissolved	20·91	16·32	37·23	1·50	21·57	Neutral.
	Total	29·53	74·51	101·07	—	—	—

No. 1 is beet wash-water from the washing machine. Yellowish-brown, when examined in a layer two centimetres thick; opaque; contained earthy matter, fibres, etc. *No. 2* is boneblack wash-water. Turbid, yellowish-grey, with numerous suspended particles. *No. 3* is osmose-water. Clear yellow, with smell of syrup. *No. 4* is the entire waste-water as it leaves the works, after passing two large settling-tanks. Turbid, with a very thick sediment and offensive odour. The author concludes by pointing out the great objections attaching to the pollution of river-water with such obnoxious fluids as these.—E. G. C.

On the Separation of Raffinose from the Molasses of the Sugar-beet. C. Scheibler. Ber. **18**, 1400.

Fifteen years ago the author noticed the occasional occurrence of sugars the complete analysis of which yielded numbers greater than 100. Such sugars, therefore, appear to contain no non-saccharine organic substances. The author suspected the presence of a body of high rotary power and of dextrin.

It is only, however, of late years since the introduction of the method of obtaining sugar from molasses by means of strontium hydrate that the question has received much attention, and that the observation of analyses of sugar solutions giving numbers greater than 100 has become common, that from such solutions the sugar has been observed to crystallise in peculiar elongated prismatic forms, which are, however, in reality only distorted forms of ordinary sugar crystals.

In 1882 Reichardt and Bittmann again concluded that a body of high rotary power must be present, and quite recently Tollens (*Ber.* **18**, 26) suggested that this body was the raffinose discovered by Loiseau, probably identical with gossypose prepared from cotton-seed cake. Raffinose was evidently obtained accidentally by Loiseau, and no direct method of preparation has yet been described. The author now shows how it may be prepared in quantity. The materials employed were the elongated crystals, the after product and the syrup obtained by Steffan's method from beet-root molasses. The crystalline products were dissolved in hot water, and to one molecule of sugar (calculated by rotary power) one molecule of strontium oxide was added. After cooling, a little monostrontium saccharate was added to induce crystallisation, and after some hours the crystallised product was separated by filtration with the pump. The mother-liquor, which contained seventy-five per cent. less sugar than the original solution, was treated with excess of strontium oxide, whereby the remaining sugar and the raffinose were both precipitated. After filtering and washing with ten per cent. boiling strontium solution, the strontium was removed with carbon dioxide. The sugar thus obtained, calculated from its rotary power, gave an apparent value of 103·3 per cent.

This double precipitation was twice repeated, the numbers rising to 108·4 and 109·2. Complete separation was now effected by fractional precipitation with alcohol. To the syrup, now rich in raffinose, absolute alcohol was added until a permanent turbidity was observed in the hot solution. After twelve hours a syrupy layer very rich in raffinose had separated. This was treated twice in the same way. Lastly alcohol was added in the cold until the turbidity just disappeared on shaking, the flask was then closed and the solution allowed to stand. After some days the raffinose separated in tufts of needles, which were completely purified by recrystallisation from alcohol. A description of the sugar will be given in a future paper.—S. Y.

New Sweet Compound and Process of Manufacturing the same. J. Y. Johnson, Middlesex. From Constantin Fahlberg, New York, U.S.A.; and Adolph List, Leipsic. Eng. Pat. 6626, June 1, 1885.

By means of this invention a new sweet compound may be prepared from coal-tar or analogous substances, containing a considerable proportion of benzene, toluene, etc. The inventors name the new substance "Saccharine," although it is not related to the class of sugars, but is a derivative of benzoic acid. The scientific name of the substance is benzoylsulphimide, and it has its composition represented by the formula—$C_6H_4.CO.NH.SO_2$. It possesses a taste similar to saccharose, but far sweeter, so that it may be employed as an advantageous substitute for sugar in all cases where the latter would be too expensive; for instance, in sweetening glucose, grape or starch sugar, and in other cases where cane-sugar is used for sweetening and preserving. A very diluted solution thereof tastes like a saturated solution of cane-sugar, and it has high antiseptic properties, which will further recommend it for many purposes in the arts and medicine. Owing to the fact that "saccharine" cannot be classed under the heading of nourishments, like sugar and similar carbohydrates, it may be used for many medical purposes where cane-sugar is excluded from the diet of certain patients, as in cases of "diabetes mellitus," and other diseases. Saccharine is difficultly-soluble in cold water; it is more soluble in warm or hot water, and can easily be obtained from such solutions in crystalline form. Alcohol and ether dissolve it readily. It crystallises in thick short prisms, in all probability belonging to the monoclinic system; they are, however, small, and imperfectly formed. It fuses about 200° C., under partial decomposition. It forms salts with the alkalis and alkaline earths, etc., similar to those formed by cane-sugar, these salts having the same pleasant and sweet taste as pure saccharine. Two very complex methods of preparation are given, the nature of which may be indicated as follows:—Toluene is heated with sulphuric acid to form sulpho-acids, which are first converted into lime-salts, then into soda-salts, the latter being treated, after drying, with phosphorous pentachloride to form sulpho-chlorides, one of which is then treated with dry ammonia gas to form an amide, which after oxidation by means of potassium permanganate yields the potash salt of "saccharine," from which by precipitation with a dilute mineral acid the pure "saccharine" is obtained.—A. W.

XVII.—(*A*) CHEMISTRY OF FOOD. (*B*) SANITARY CHEMISTRY. (*C*) DISINFECTANTS, Etc.

(*B*) SANITARY CHEMISTRY.

Notes on Leaden Service-tubes for Water-supply. S. Steiner. Chem. Centr. **16**, 524.

The water-supply of Budapest is carried into the houses in leaden pipes. The pipe for the water of the Hygiene Institute, which served for these experiments, was 39m. long, and had been laid for ten years. A sample of water taken, after a quick stream had been allowed to flow through the pipe, contained 0·085mllgrm. lead per litre; after a slow stream, 1·04mllgrm.; the water in the pipe after standing for twenty-four hours contained 1·224mllgrm.; after forty-eight hours, 1·7mllgrm.; after seven days, 3·25mllgrm.; and after a month, 4·7mllgrm. The water taken from the street-hydrant contained no lead. The amount of lead present was determined by evaporating the water with nitric acid, then treating with hot hydrochloric acid, and precipitating with sulphuretted hydrogen; finally weighing as lead sulphate. —S. R.

Clarification of Waste Waters from Dyeworks. E. Hankel. Mittheilungen des Gewerbe-Museums in Wien, May, 1885.

To effectually clarify the waste-water from dyeworks it is recommended to treat the water with lime, allow the mixture to settle, draw off the supernatant solution, and pass the sludge through filter-presses.—D. B.

Purification of Water according to the Gaillet and Huet System. Mittheilungen des Techn. Gewerbe-Museums in Wien, May, 1885.

This process involves the use of caustic lime and caustic soda. The purified water contains sodium sulphate and sodium chloride—*i.e.*, salts which are perfectly harmless. The practical results achieved are very satisfactory, as will be seen from the following figures showing the hardness of the water before and after purification:—

	Hardness before purification.	Hardness after purification.
1.	23—27°	2—4°
2.	29	2—5
3.	39—42	3—5
4.	42	4—6
5.	26	4—5
6.	38—40	3—5

—D. B.

Poisoning by Coal-Gas and Charcoal Fumes. J. Poleck. Rep. Anal. Chem. **5**, 225.

The author published together with Biefel, in the *Zeit. Biol. Chem.* 1880, an investigation of this subject, which has been subjected to a lively criticism by A. Wagner (*Rep.* Nov. 1884). Against the strictures of the latter the author enters a strong protest, especially vindicating the methods adopted for collecting the gases, and the results of their analysis.—C. F. C.

XVIII.—ELECTRO-CHEMISTRY.

Improvements in the Manufacture of Phosphates. Ph. M. Justice, London. From Sidney Gilchrist Thomas, Paris. Eng. Pat. 11,805, August 30, 1884.

This invention relates to the manufacture of phosphates free from iron, from phosphoric slags and minerals containing iron. The material is dissolved in acid, and the current from a dynamo-electric machine passed into the nearly neutral solution until the whole of the iron is deposited. The free phosphoric acid may be used for preparing high-class phosphates.—S. Y.

Improvements in Secondary Batteries. Ernest George Dornbusch, London. Eng. Pat. 11,853, Sept. 1, 1884.

In Faure's and other secondary batteries in which the electrodes are enclosed in, or separated by means of felt, flannel, or other suitable absorbent material, the salt of lead is liable to penetrate through the material and establish short circuits between the two electrodes forming the secondary couple. The inventor taking account of this penetration of the lead salt through the absorbent material, makes the latter a carrier or support for the active substances. The lead plates are slit into strips from a short distance from one edge right down to the opposite edge, and the felt or other material is folded backwards and forwards so as to completely cover the plates. The prepared plates are then impregnated with the lead compound, and finally dipped into a paste of red lead and water. They are then placed in bags of felt or flannel, and reduced or peroxidised to form the elements of the secondary battery.—S. Y.

Carbon Fabrics or Materials, their Manufacture and Application. Joseph Stokes Williams. Eng. Pat. 12,065, September 5, 1884.

This method of manufacturing carbon sheets, ribbons, fabrics, plates, or rods for use in electrical work consists in impregnating vegetable matter, moulded or woven into the desired shape, with starch, dextrin, or finely-divided wood pulp or paper, and subsequently carbonising in a chamber charged with hydrocarbon vapour. The material may also be impregnated with finely-divided carbon, and the subsequent carbonising be performed by passing a strong current of electricity through it.—E. J. B.

Improvements in Apparatus for Lighting Gas and other Inflammable Substances. James Grieve Lorrain, London. Eng. Pat. 12,139, September 8, 1884.

The apparatus is a form of continuous electrophorus or convection induction machine, by means of which sparks are made to pass between two outer points. Various devices for causing rotation are described, and methods are adopted for regulating the distance between the points, and for securing perfect insulation and dryness. —S. Y.

Improvements in Secondary Batteries or Accumulators. Desmond Gerald Fitz-Gerald, Brixton. Eng. Pat. 12,350, September 12, 1884.

The object of this invention is to diminish the time required to "form" the plates in the secondary battery of the Planté type, and to allow of the substitution in other forms of accumulator of a simple plate of lead in place of anodes of more complicated structure. The invention consists in employing a solution of magnesium sulphate as the electrolyte in charging the secondary battery. As the solution becomes acid magnesia or magnesium carbonate is added. When the battery is discharged the magnesium sulphate may be replaced by dilute sulphuric acid. The process of "forming" can thus be effected by one reversal of the current, that is, by two operations of charging in opposed directions. The solution of magnesium sulphate is also applied to those batteries in which the lead plates are roughened, corrugated, or perforated, in which case only one operation of charging is required.—S. Y.

Improvements in Voltaic Batteries. Desmond Gerald Fitz-Gerald and T. J. Jones, London. Eng. Pat. 12,802, September 25, 1884.

The inventors point out that zinc is unsuitable for the positive element of a primary battery, because it is impossible economically to recover the zinc in the metallic state from the sulphate. They propose to employ spongy lead as positive elements, and lead peroxide as negative elements, and the essential feature of the invention consists in the conversion of sulphate of lead into spongy lead to form the positive elements, and of spongy lead prepared in this or other ways into lead peroxide for the production of negative elements, both operations being performed by means of electrolysis. In the first operation a pasty mass of sulphate of lead and magnesia or an alkali, is spread on lead plates, and after hardening the sulphate is reduced in tanks in which the electrolyte is magnesium sulphate. In preparing the negative element the spongy lead is allowed to oxidise partially in the air, and is peroxidised by means of electrolysis. —S. Y.

Improvements in Primary or Galvanic Electric Batteries and in their Construction. Blanche A. Rowan, Southsea. Eng. Pat. 13,744, October 17, 1884.

By using broken carbon, moistened with a solution of any metallic nitrate, such as the nitrate of mercury, silver, aluminium, chromium, lead, copper, or iron, enclosed in an envelope or hollow cell of carbon to form a negative electrode, and as a positive electrode zinc immersed in a solution of any suitable chloride, such as sal-ammoniac, a battery is formed having a constant current and a high electromotive force.—T.

A Compound Galvanic Battery. S. H. Emmens, London. Eng. Pat. 13,759, October 17, 1884.

The compound battery referred to, consists of a primary charging a secondary battery, the cells of each class being of any known construction. This combination reduces the labour of charging and discharging, the electromotive force of the primary battery being easily brought to any required degree of tension. Constant action of the secondary battery is maintained by replenishing the primary battery while at work.—T.

Improvements in the Preparation or Manufacture of Elements for Primary Electric Batteries. C. P. Elieson, Essex. Eng. Pat. 14,197, October 27, 1884.

Plates or other pieces of carbon are placed in water or other solution capable of giving off oxygen, a current of electricity is then passed through the carbon in order to charge it with oxygen. After having been charged to the desired extent, the plates or pieces are removed from the liquid and exposed to the air, in order that they may become thoroughly oxidised. By using carbon prepared in this manner, the efficiency of a battery is greatly increased on account of no rapid polarisation taking place.—T.

Improvements in Galvanic Batteries. Gustavus Baron de Overbeck, London. Eng. Pat. 14,485, November 1, 1884.

In order to prevent the polarisation produced in batteries by the formation of bubbles of hydrogen on a carbon or other insoluble electrode, the author proposes to use an aqueous solution of a hypochlorite salt, or free chloric acid, or free perchloric acid, adding as may be suitable sodium or potassium chloride.—T.

Improvements in and connected with Electric Batteries or Elements. P. M. Justice, London. Eng. Pat. 14,548, November 4, 1884.

This invention has for its object the more complete separation of the liquids in hydro-electric elements or batteries of two liquids by means of a porous membrane of gold-beaters' skin, amianthus or ordinary paper, or by a porous ring or disc of terra-cotta, or the like placed in a slanting position between the heavy and lighter liquid, and having a tube inserted into it in such a way that the gases formed can escape through the tube without disturbing the liquid above.—T.

XIX.—PAPER, PASTEBOARD, Etc.

Improvements in Treatment of Xylonite, etc. A. J. Boult, London. From W. C. Zeidler, Toronto. Eng. Pat. 8012, July 1, 1885.

The object of this invention is to provide a simple, quick, and effective process for polishing the surface of celluloid, xylonite, zylonite, chrolithion, pyroxyline, and similar substances, and at the same time to secure the said material when made in any shape to wood or other material. It consists essentially in submitting the celluloid or like material to pressure while treated, and preferably cooling the same off. Only a few minutes are occupied in pressing, heating, and cooling. "By the adoption of this process it only occupies about five minutes from the time that the celluloid is first glued on to the board until it is polished and finished ready to be cut into keys, etc."—H. A. R.

Improvements in the Manufacture of Vegetable or Paper Parchment. T. R. Shilito, London. From C. Arnold, Germany. Eng. Pat. 8130, July 4, 1885.

The main points of interest in this invention are the following :—1. In the manufacture of the parchment the method of washing out the acid from the material under treatment by the repeated use of the same acidulated

water until its degree of concentration has reached a certain point, for the purpose of the more advantageous recovery of the acid *substantially as described and illustrated.* 2. A chest, which is cooled by fresh water, and from which the acidulated water is continuously removed where it is least saturated with acid, and is conducted to the jet-pipes for this purpose, as described in the specification. The drawing should be consulted.
—H. A. R.

Improved Process of Preparing Sulphate of Lime for Paper-making, etc. C. W. Knowles, Nova Scotia. Eng. Pat. 12,193, September 9, 1885.

INVENTOR prepares a thick or semi-solid pulp of the sulphate with water, in a convenient form for immediate use, or for transit, packing, etc.—H. A. R.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES AND EXTRACTS.

Liquid Carbonic Acid. H. Herberts. Chem. Centr. **16**, 558, 560, 572.

LIQUID carbonic acid can now be bought in iron or steel bottles containing 8kilos. of the liquid, which corresponds to about 4000 litres of the gas at ordinary temperature and pressure, and costs about 1 mark per kilo. At this price it furnishes the cheapest means for aerating beer and mineral waters, and is also extensively used for raising sunken ships, for driving torpedoes, for extinguishing fires, for cooling purposes, and by the firm of Fr. Krupp in Essen for the condensation of steel and other metals, and is further suggested as a motive power for tramcars and air balloons. In the German patent No. 28,769, a method for the preparation of carbonic acid and Glauber's salts from acid sulphates (bisulphates) is described. A bisulphate containing 70 per cent. of sodium sulphate, and 25 to 30 per cent. of free sulphuric acid can be used with advantage. The apparatus employed is described in detail in the specification, and consists essentially of a leaden vessel containing a solution of the bisulphate, and having a stirring apparatus and gear fixed airtight to it. By means of a tube and pump an equivalent quantity of chalk or other carbonate suspended in water in a second vessel can be forced into the first, and the stirrer is then set in motion. The liberated carbonic acid passes through a suitable drying apparatus to a gasometer, from which it is afterwards condensed. The residue consisting of calcium and sodium sulphates is removed to a filter press, and the sodium sulphate crystallised or calcined from the filtrate. The calcium carbonate employed is that obtained as a waste product in the manufacture of caustic. It is suggested that magnesium carbonate should be substituted for chalk, thereby getting no precipitate but a double sulphate of magnesium and sodium which could be used for the preparation of sulphuric anhydride. By the evaporation and expansion of the liquid carbonic acid, a large quantity of heat is absorbed. An apparatus is described for allowing this to take place round a tube containing a solution of calcium chloride; the latter is so cooled that it can be used for freezing water and the manufacture of ice. The carbonic acid, which is thus used, passes over sodium carbonate, which is thereby converted into bicarbonate if care be taken that the necessary amount of moisture is present. The bicarbonate formed in this way is used over again in the carbonic acid manufactory.—S. R.

On Artemisia Gallica, Wild., as a Source of Santonin, and on its Chemical Composition. Ed. Heckel and Fr. Schlagdenhauffen. Compt. Rend. **100**, 804—806.

THIS plant, which is widely distributed in France, contains 1 per cent. of ethereal oil, and a crystalline body (camphor ?) volatile with steam. The flowers give 3 per cent. of extract with petroleum, consisting chiefly of wax, a yellow colouring matter and some chlorophyll. The chloroform extract contains considerable quantities of santonin, and a resinous body apparently isomeric with santonin. The alcoholic extract from the whole plant contains glucose, tannin, colouring matter, and an alkaloid.—S. Y.

Paraldehyde as a Remedy against the Poisonous Action of Strychnia. Arpád Bókai. Chem. Zeit. **9**, 960.

THE author has found in paraldehyde a powerful antidote against poisoning by strychnia. Hitherto chloralhydrate has been used, but owing to its powerful action on the heart, paraldehyde is recommended. It is said to act as counter poison to brucine, thebaïne and picrotoxine.
—D. B.

The Estimation of Glycerol in Aqueous Solution and in Fats. R. Benedikt and R. Zsigmondy. Chem. Zeit. **9**, 975.

THE authors find that the method adopted by Fox for the detection of glycerol in linseed-oil varnish is, if conducted with certain precautions, capable of giving accurate quantitative results when applied either to the estimation of glycerol in aqueous solutions or to the examination of fats. The method depends upon the oxidation of glycerol, by permanganate in alkaline solution, to oxalic acid, carbon dioxide, and water, in accordance with the equation—

$$C_3H_8O_3+3O=C_2H_2O_4+CO_2+3H_2O.$$

The following are the details to be observed in the *estimation of glycerol in aqueous solutions*: An amount of solution which shall contain about 0·2—0·5grm. of glycerol, is rendered alkaline by the addition of 10grm. of pure potassium hydrate, and then potassium permanganate, either as a five per cent. solution, which is best, or in the solid form, added until the liquid appears almost black. The mixture is heated to boiling, whereby a separation of manganese dioxide takes place, decolourised by means of sulphurous acid, passed through a filter of sufficient size to hold at least one-half of the liquid at once, and the residue well washed with boiling water. The filtrate is acidified with acetic acid, which, by setting free sulphurous acid, causes the removal of any turbidity due to manganese peroxide. The filtrate is then precipitated with acetate of lime. The precipitate contains sulphate of lime and silicic acid in addition to calcium oxalate, hence the amount of oxalic acid cannot be inferred from the weight of the residue after ignition, but is to be arrived at either by titration of the precipitate with permanganate in acid solution or by determining the alkalinity of the ignited precipitate. Test analyses gave 90·3, 91·4, 92·3, and 92·7 per cent. of glycerol instead of 91·0 per cent., and in a dilute aqueous solution containing 0·05 per cent., this method gave 0·0507 per cent., 600grm. being taken for the analysis. For the determination of glycerol in fats, from two to three grammes of ordinary fats, and from ten to twenty grammes when the proportion of glycerol is small, will be found sufficient. The fat is saponified with potassium hydrate and *pure* methylic alcohol, the alcohol evaporated off, and the soap dissolved in hot water, and decomposed by dilute hydrochloric acid in excess. Heat is now applied to effect the complete separation of the fatty acids, and, in the case of liquid fats, some hard paraffin is added to assist the solidification of the fatty acids, the dish being set in cold water. The acid liquid is filtered into a capacious flask, the fatty acids being well washed with water; the filtrate is neutralised with potash, and, after a further addition of 10grm. of potassium hydrate, the glycerol estimation proceeded with, as described above. The authors employ methylic and not ethylic alcohol in the saponification, since the latter is completely expelled from the soap with difficulty, and under certain conditions of alkalinity and concentration of the solution, is oxidised by permanganate to oxalic acid. It has been found by experiment that the soluble fatty acids—viz., acetic, butyric, and caproic—do not, when subjected to the oxidation process above described, yield any acids precipitated by lime in acetic acid solution. The authors have obtained the following results with various fats:—Olive-oil, 10·15—10·38 per cent. of glycerol; linseed-oil, 9·45—9·97; cocoa-nut oil, 13·3—14·5; tallow, 9·94—9·98; butter, 10·21—11·59; Japan-wax, 10·3—11·2; beeswax, 0·00. Since the fats contain, upon an average, 10 per cent. of glycerol, which is not found at all in beeswax, the percentage of fat in a sophisticated beeswax may be calculated with sufficient accuracy for technical purposes, by multiplying the percentage of glycerol found by ten.—W. D. B.

Examination of Essential Oils. H. Hager. Pharm. Centr. 1885, 316.

For the examination of certain essential oils, chiefly with the view to distinguish the "natural" products from artificial imitations, the author employs an aqueous solution of mercuric nitrate (10 per cent.). Four drops of the essential oil are dissolved in 2cc. of alcohol, and 2 to 3 drops of the nitrate solution added. No reduction occurs with the essential oils of laurel (ol. lauro cerasi) and bitter almonds. The greater number of oils, however, have a reducing action on the nitrate, and their presence in admixture with the above is indicated by the formation of a grey precipitate of metallic mercury. The artificial bitter almond water also precipitates the solution, and is thus distinguished from the natural. The following oils—viz., ol. cassiæ cinn., succini, petræ, linanthracis, vineæ, vitis viniferæ—do not readily reduce the nitrate, but their presence in bitter almond oil is indicated by the opalescence occassioned by diluting with alcohol (6 parts of sp. gr. 0·895). Mustard oil treated under the above conditions gives a slight reduction; the artificial products sold under this name were found, on the other hand, to reduce rapidly, giving a dark-grey precipitate.—C. F. C.

Papaverin. G. Goldschmiedt. Monatsh. Chem. 6, 372.

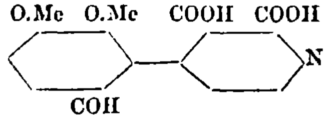
In continuation of a previous communication (*Ibid.* 4, 704) the author gives the results of a further investigation of the oxidation of papaverin by potassium permanganate in dilute aqueous solution at the boiling temperature. In addition to carbonic and oxalic acids and ammonia, the following products of the reaction were isolated:—(*a*) Dimethylprotocatechuic acid (melting point 180°); (*b*) an acid body which, from its composition, $C_{10}H_{10}O_6$, *melting point* 180°, *and reactions*, appeared to be hemipic acid (*Ibid.* 3, 351); (*c*) the main product, which is an acid, having the composition $C_{16}H_{13}NO_7$, melting at 233°, and termed by the author papaveric acid. It is a dibasic acid, giving both acid and basic salts with the alkali metals. The following salts are described:—

$C_{16}H_{11}NO_7K_2.2\frac{1}{2}H_2O$ $C_{16}H_{11}NO_7HK$
$C_{16}H_{11}NO_7Ca.1\frac{1}{2}H_2O$ $C_{16}H_{11}NO_7Cu_3(OH).\frac{1}{2}H_2O$
$C_{16}H_{11}NO_7Ag_2.\frac{1}{2}H_2O$ and $C_{16}H_{12}NO_7Ag.C_{16}H_{13}NO_7.H_2O$

The acid forms a compound with hydrochloric acid, and is obtained from its solution in the latter in slender yellow needles, $C_{16}H_{13}NO_7HCl.2\frac{1}{2}H_2O$. The acid is easily converted into the mononitro derivative, $C_{16}H_{12}(NO_2)NO_7$ (melting point 215°) by treatment with nitric acid, dilute as well as concentrated, and by nitrous acid in acetic acid solution. Papaveric acid heated in a stream of hydrogen at a temperature (235°) a little above its melting point, loses 1mol. CO_2, and is converted into pyropapaveric acid, $C_{15}H_{13}NO_7$. The chief product of the fusion of the acid with potassium hydrate is protocatechuic acid. Lastly, the author isolated from the products of the oxidation of the papaverin by permanganate an acid (*d*) $C_8H_5NO_6$, melting at 249°, and identified as α-pyridinetricarboxylic acid. The following statistics are given of the yield of these several products: From 264·5grm. papaverin an aggregate of 100·3grm. of crystalline products was obtained, from which were isolated—

	Grm.
(*a*) Dimethylprotocatechuic acid	9·9
(*b*) Hemipic acid	0·8
(*c*) Papaveric acid	40·2
(*d*) α-Pyridinetricarboxylic acid	12·0
Oxalic acid	12·4

In conclusion, the author applies these results to the discussion of the constitution of papaveric acid, regarded as the immediate product of the oxidation of papaverin, and as yielding by further resolution the products *a*, *b*, *d*. The experimental evidence is summed up by the constitutional formula—



which the author adopts as the working hypothesis for further investigations.—C. F. C.

Adulteration of Tartar. Ziurek. Rep. Anal. Chem. 5, 245.

Tartars, which are sold in powder, are sometimes adulterated with alum, usually to the extent of about 20 per cent. In four samples, examined by the author, the quantities estimated were 20·6, 26·7, 5·4 and 22·9 respectively. *Indications of this adulteration are afforded* by the percentage of water which in the normal product does not exceed 2 per cent., whereas in the adulterated article it may amount to 8—10 per cent. If this indication *is confirmed by the sulphuric acid reaction, the* alumina should be determined, after igniting the specimen.—C. F. C.

Identification of Alkanet. H. W. Vogel. Rep. Anal. Chem. 5, 245.

The author points out, in reference to a recent communication of J. Herz (*Ibid.* 210), that the colouring matter of the alkanet is most easily identified by the characteristic absorption spectra of its solutions. The solution in amyl alcohol gives the best results. On adding ammonia, the three bands, in the blue green, give place to two, situated one on either side of the D line.
—C. F. C.

Improvements in the Manufacture of Chloroform and Acetic Acid or Purified Acetates. From Gustavus Michaelis and William Turner Mayer, New York, U.S.A. Eng. Pat. 8523, July 1, 1885.

This invention claims the process of producing chloroform and valuable residual products, by subjecting crude acetates to dry distillation at high temperatures, removing the fluid products, and subjecting them to the action of hypochlorites, condensing the chloroform therefrom and subsequent purification. Also the production of acetic acid or acetates from the residuals. The invention is based on the discovery that when a crude acetate, as of lime, is subjected to dry distillation, only very small quantities of acetone ($CH_3CO.CH_3$), boiling at 56°, are formed, whilst very considerable quantities of dimethylacetal $C_2H_4(OCH_3)_2$ boiling between 60° and 65°; ethylmethylacetal $C_2H_4(OC_2H_5)OCH_3$, boiling at about 85°; methylethylketone ($CH_3.CO.C_2H_5$), boiling between 75° and 80°; diethylketone ($C_2H_5.CO.C_2H_5$), boiling between 75° and 85°; metacetone $C_6H_{10}O$, boiling between 82° and 86°, and other still higher boiling ketones, as dumasin and other liquids, together with a large quantity of an apparently oily substance, which also holds some of the before-stated ketones in solution, are the result of the process. The further discovery that while pure acetone yields when distilled with a hypochlorite 33 per cent. of chloroform, the above enumerated ketones and other liquids, all of which possess higher boiling points than does acetone, will yield, when freed from water and treated with a hypochlorite, chloroform in the large and unprecedented quantity of measure for measure.—T.

XXII.—GENERAL ANALYTICAL CHEMISTRY.

Detection and Estimation of Iodine. E. H. Cook. J. Chem. Soc. (Trans.), 1885, 471.

On adding hydrogen peroxide to a solution acidified with acetic acid, and containing chlorides, bromides and iodides, only the iodine is liberated in the free state, and the separation gives very good results when used for quantitative determinations, as the results show.

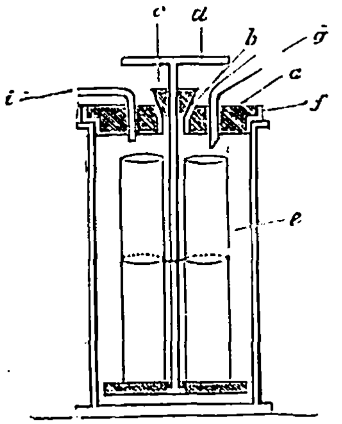
—G. H. B.

Colorimetric Method for Determining Small Quantities of Iron. A. Thompson. J. Chem. Soc. (Trans.), 1885, 493.

This method is an application of the reaction between ferric salts and thiocyanic acid, and is available in presence of large quantities of most other metals to estimate minute quantities of iron. Mercuric chloride must be absent. The substance to be examined is dissolved in a suitable acid, and the solution evaporated to expel excess of acid. After oxidation of ferrous to ferric iron by the addition of a permanganate solution, potassium thiocyanate is added, and the colour produced is compared with that obtained with known quantities of iron. Figures are given to show the degree of accuracy obtainable.—G. H. B.

An Apparatus for Fractional Distillation under Reduced Pressures. A. Gorboff and A. Kessler. Ber. **18**, 1363.

The authors describe a modification of Konovalow's apparatus (*Ber.* 17, 1535), which may be employed for large quantities of substance. In the diagram *a* is an ordinary cork, well paraffined and encircled by an indiarubber ring *f*, to make it quite air-tight. The indiarubber cork *c*, through which the glass rod *d* passes, fits into a glass tube *b*, which passes through *a*. The end of the distillation apparatus is represented by *g*, and connection with the pump is effected by the tube *i*. If the glass rod is well greased, it may be readily turned, even at so low a pressure as 16mm., so as to bring each receiver in turn under the tube *g*.—S. Y.



Apparatus and Arrangements of the Dresden Laboratory. Walther Hempel. Ber. **18**, 1434.

(1.) *Laboratory Filter-Press.*—The filter proper consists of two perforated porcelain plates, between which is a thick indiarubber ring, perforated with one hole to admit a glass tube, which conveys the precipitate and wash water into the filter. The glass tube is connected with an upright glass tube, two or three metres long, and provided at the top with a funnel into which the precipitate and liquid, and afterwards the wash-water, are poured. The filter rests on two slabs of glass, supported by an iron frame, the lower edges of which rest on a split glass tube, forming a trough through which the filtrate runs, and falls into a beaker placed below and at one end of the slightly sloping trough. When the apparatus is to be used the porcelain discs are separated, on one of them is placed in succession a piece of coarse linen suitably cut, a filter paper, the indiarubber ring, a second filter paper, another piece of linen, and finally the second porcelain disc. The filter is pressed together by iron screws covered with indiarubber, and the discs are protected from the screws by pieces of wood or hard rubber. The glass tube at first passes well into the filter, but after the precipitate has formed a moderately coherent cake, it is withdrawn as far as the indiarubber ring, leaving a canal. The wash-water fills this canal and penetrates the whole of the precipitate. The indiarubber rings should be kept under water when not in use.

(2.) *Draught for Poisonous Gases.*—In place of the ordinary large and somewhat dark draught chambers, the author makes a long narrow orifice in the wall of the chimney, and places above this a sloping glass plate, supported by T-shaped iron pieces. The evaporating basin or other vessel is placed below the glass roof, and the vapours are carried away by the current of air.

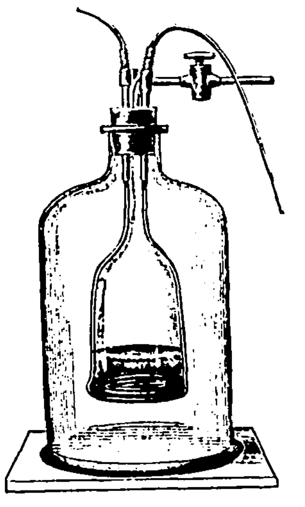
(3.) *Apparatus for Preparing Hydrofluoric and Hydrofluosilicic Acids.*—The author employs cast-iron vessels in preference to lead or platinum. The apparatus consists of a flanged pot and cover, which are held together by four screw-clamps. In the centre of the cover is fitted an iron gas-pipe, 30mm. wide, at the upper end of which is a three-way piece, open at the top, and *leading at the side to a lead tube, to which it is connected* by a flange. The tube may be closed at the top by a cork. The lead tube passes to the absorption apparatus, which is a lead cylinder 15cm. wide and 70cm. high, closed at the top by a perforated lead basin, and fitted at the bottom with a leaden exit tube. A narrow lead tube passes down one side of the cylinder, forms a coil at the bottom and passes up the other side. By allowing a current of water to circulate through this the apparatus is kept cool. The cylinder above the coil is filled with pieces of charcoal. The mixture of fluor spar and concentrated sulphuric acid is heated in the iron pot by a naked flame, and the gas passes into the cylinder, in which it is absorbed by water which is placed in the perforated basin at the top, and moistens the charcoal. Pure ammonium fluoride is prepared by dividing the crude acid into two portions, neutralising one with ammonia, and then adding the other. The liquid is evaporated in a platinum basin, and allowed to crystallise. For hydrofluosilicic acid the lead delivery-tube is replaced by a glass one, which dips under water. If a tube 15mm. wide is employed, mercury may be dispensed with.

(4.) *Oxygen Apparatus.*—This was seen by the author in New York, but he could not discover the inventor. It resembles the apparatus for hydrofluosilicic acid, but the upper end of the three-way tube is connected with a large funnel fitted with a stopcock. 50grm. of potassium chlorate at a time are shaken through the funnel into the pot which is heated by a naked flame. The stopcock is closed when a glowing taper is rekindled in the funnel.

—S. Y.

Vacuum Desiccator with Appliance for Heating. R. Anschütz. Ann. **228**, 305.

The apparatus illustrated by the accompanying drawing, serves to heat a liquid contained in a vacuum desiccator without affecting the vacuum. The heating arrangements consist of a thin lead pipe, both ends of which are



passed through a cork fitted into the neck of the bell jar. A glass tube communicating with the air pump and vacuum gauge also passes through the cork. The lead pipe is rolled together to form a spiral, both sides of which are covered with nickel wire gauze. This forms a portable bed for the substance to be dried. The heating agent is then allowed to circulate through the pipe.

—D. B.

On the Volumetric Estimation of Nitrogen. H. Hufschmidt. Ber. **18**, 1441.

The author finds that the results given by Dumas' method are always too high owing to the air given off on heating the sodium bicarbonate or manganese carbonate, and he recommends the use of *marble and* hydrochloric acid heated nearly to its boiling point, which gives better results even than sodium carbonate and sulphuric acid. With marble three litres of carbon dioxide were found on an average to contain 0·2cc. of gas unabsorbed by caustic potash. In an analysis the author passes about three litres of carbon dioxide to drive out the nitrogen, and subtracts 0·2cc. from the real volume of nitrogen. A modification of Zulkowsky's nitrometer is recommended.—S. Y.

A New Method for the Volumetric Determination of Sulphur. N. Klobukow. Ber. **18**, 1861.

The process has for its object the estimation of the total amount of sulphur in all compounds which can be decomposed by acids. It is based on the fact that hydrogen *in statu nascendi* converts under certain conditions sulphur and sulphur dioxide into sulphuretted hydrogen, which can be determined by titration with iodine. The method is carried out in the following manner:—The substance to be tested is put into a flask which is connected with a hydrogen apparatus and an absorbing arrangement. It is also fitted with a separating funnel which supplies the acid necessary for the decomposition. The absorbing arrangement consists of a spacious flask, through whose neck a glass tube reaches down to the bottom, and which holds standard iodine solution and two Liebig's potash bulbs, one containing iodine solution and the second potassium iodide solution. After bringing the weighed substance or measured solution into the decomposing flask, water and granulated zinc, free from sulphur and arsenic are added, and hydrogen passed through the apparatus for about 10 minutes. The acid is then allowed to flow gradually from the separating funnel into the decomposing flask. Either of two cases may now occur; either sulphur dioxide is given off along with the appearance of a precipitate of elementary sulpur, or no sulphur is precipitated. In the first case *the flask is cooled by being placed in a dish with cold* water, while the decomposition is carried on very slowly. The liquor which is at first turbid gradually becomes clear. The cooling is then discontinued, more acid is added, and the flask gently heated until all the zinc is dissolved. The heat is then raised to 70—80° C., the current of hydrogen increased to produce agitation until all traces of sulphuretted hydrogen are driven into the absorbing flask. If no elementary sulphur is separated in the decomposing flask, the cooling can be dispensed with. If the substance originally contained sulphuric acid or this acid was formed during the decomposition, it will be found in the decomposing flask, and can be estimated in the usual manner.—S. H.

Remarks on the Analysis of Potassium Permanganate and Manganese Peroxide by means of Hydrogen Peroxide. G. Lunge. Ber. **18**, 1872.

In a former paper on "New Applications of the Nitrometer" (*Journ. Soc. Chem. Ind.* 4495) the author recommended the decomposition of permanganate of potash by means of hydrogen peroxide in excess, whereby the oxygen given off represents double the amount of active oxygen in the permanganate. Martinon (*Bull. Soc. Chim.* 1885, 355) states that a precipitate of manganese peroxide is formed on adding acid hydrogen peroxide to neutral permanganate or neutral hydrogen peroxide to acid permanganate. Consequently according to the latter $6KMnO_4$ and $9H_2O_2$ give off $9O_2$, whereas according to Lunge, $6KMnO_4$ and $15H_2O_2$ act upon each other, generating $15O_2$. Lunge now shows that the precipitate of manganese peroxide can be avoided, if sufficient sulphuric acid is present and the hydrogen peroxide is in excess, and is added all at once. If these precautions are observed, the analysis of permanganate by hydrogen peroxide and by ferrous sulphate give identical results. A further argument that Martinon's reaction does not take place is furnished by the fact that manganese peroxide in acid solution reacts with hydrogen peroxide, thus: $MnO_2 + H_2O_2 = MnO + H_2O + O_2$. On this reaction Lunge bases a manganese peroxide test by means of the nitrometer which is very accurate, can be done in very little time, and requires no balance, or weights, etc.

—S. H.

Diphenylamine and Crystallised Phenol as Reagents for Nitrates and Nitrites. H. Hager. Chem. Centr. **16**, 586, 588.

Diphenylamine has been used as a test for nitrates and nitrites in concentrated sulphuric acid for several years. The author, however, has modified the method so as to render it sharper. He uses the diphenylamine in two forms—the one is a solution consisting of 1grm. diphenylamine dissolved in 30cc. absolute alcohol, the other is a mixture of this solution with five or six times its volume of pure concentrated sulphuric acid. Oxidising agents —*e.g.*, chromic acid, manganic oxide, ferric oxide, arsenic, iodic, chloric, tungstic, and molybdic acids, the salts of these substances and chlorine gas also produce a blue colouration, whilst manganous and ferrous salts, arsenious and oxalic acids if present may hinder the formation of the blue colour. The method of testing is as follows:—About 1cc. of pure concentrated sulphuric acid is poured into a reagent cylinder, and three to four drops of the diphenylamine solution added and well mixed. On to the surface of this is gently poured 3 or 4cc. of the solution to be tested; the blue colour will be produced at the junction of the two liquids if a nitrate or nitrite be *present*. If the liquid to be tested be first introduced into the cylinder, and the diphenylamine sulphate solution be poured gently down the side of the tube, it will sink to the bottom of the vessel, and will be completely coloured blue. This last *method* gives better results than the first. One drop of 30 per cent. nitric acid in 60cc. of water gives a distinct dark blue colouration. With smaller quantities of nitric acid, if no blue colouration is obtained, *the two liquids are mixed by agitating* the cylinder, and an additional quantity of sulphuric acid gently added, and the whole allowed to stand for 30 minutes. One drop of 30 per cent. acid in 200cc. of water can be detected in this way. *If chlorine be present* the author then uses phenol in the following way:—To a few cc. of the suspected liquid 2 to 3cc. of 25 per cent. hydrochloric acid are added, and then a few crystals of phenol, and the mixture heated to 80 or 90° C. After cooling (?) 1 to 2cc. of concentrated sulphuric acid are gently poured down the sides of the cylinder, when at the junction of the two liquids a bright red colour will be produced. This phenol reaction can be used in the presence of ferric salts, arsenic acid, etc.—S. R.

Diphenylamine, a Valuable Reagent for Detecting Free Chlorine. H. Hager. Chem. Centr. **16**, 588.

Diphenylamine furnishes even a more delicate test for free chlorine than it does for nitric and nitrous acids. A solution of diphenylamine sulphate is prepared by taking 1 volume of a 3·3 per cent. diphenylamine solution in absolute alcohol, and mixing with it 5 volumes of pure concentrated sulphuric acid. Four to five cubic centimeters of the liquid to be tested for chlorine, are poured into a test glass or cylinder 1cm. wide, and then so much of the diphenylamine solution is added, that after being cautiously poured so as to glide down the inside of the cylinder, it collects in a layer at the bottom. According as there is more or less chlorine present, the upper part of the layer of diphenylamine sulphate solution becomes instantly, or in the course of a minute, coloured blue. Even with very small traces of chlorine, not detected with iodised starch paper, the reaction is evident. For very small traces of chlorine it is rendered more delicate still if 3 or 4cc. of the solution to be tested are poured into a test tube, and then some 1 to 1·5cc. of the diphenylamine sulphate solution are so added that the liquids form two layers. If the tube be suddenly agitated to cause complete mixing, a strong blue colour is at once formed, which only momentarily appears, and then vanishes. During the agitation a piece of white paper is held obliquely to the cylinder, so that the momentary appearance of blueness may be readily perceived. Suppose even on agitation no reaction ensue, then about 1cc. of pure concentrated sulphuric acid should be run down the side of the cylinder so that it collects on the bottom, and forms a layer. The slightest trace of chlorine will now manifest itself by the sulphuric acid becoming blue. Traces of free bromine are not detected by the diphenylamine test.—W. S.

Influence of Boric Acid on some Colour Reagents. A. Joly. *Chem. Zeit.* **9**, 779.

Boric acid does not effect a change in the colour of the dye helianthin, tropæolin OO, or orange No. 3 (Poirrier). The author therefore recommends the use of a standard solution of borax for the titration of acids instead of normal alkali.—D. B.

Monthly Patent List.

ENGLISH APPLICATIONS.

1885.

I.—GENERAL PLANT, APPARATUS, AND MACHINERY.

10750 A. Langdon, London. Improvements in apparatus or means for utilising heated air as motive power. September 11

10761 H. C. Patterson and R. Miller, Glasgow. Improvements applicable to steam-boiler and other furnaces. September 11

10805 J. Murrie, Glasgow. Improvements in apparatus for indicating temperature or pressure. September 12

10893 G. F. Redfern, London—Communicated by L. Evesque and M. H. Fontès, France. An improved apparatus for automatically registering and recording high temperatures. September 11

10907 J. Murrie, Glasgow. An improved apparatus for separating vapours from liquids. September 15

10912 J. B. Alliott, London. Improvements in filter-presses and in apparatus connected therewith. September 15

11036 A. Pople and R. Mogg Bryant, London. A new composition for preventing and removing incrustation in steam boilers. September 17

11271 E. W. Killick, London. Improvements in kilns. September 22

11467 J. Pickering, Walton, Liverpool. Iron-jacketed hot air furnaces for heating drying chambers. September 26

11812 J. Gray, Glasgow. Improvements in centrifugal machines for separating liquids of different specific gravity. October 5

12189 A. Gapper Southby and F. Delacourt Blyth, London. Improvements in the mode of and apparatus for making ice and pumping highly rarefied condensible vapours. October 13

12195 W. P. Thompson, Liverpool—Communicated by A. Backus, jun., United States. Improvements in or appertaining to furnaces. Complete specification. October 13

12310 J. Gwynne and D. Home Morton, London. Improvements in or pertaining to centrifugal pumping machinery. Complete specification. October 15

II.—FUEL, GAS, AND LIGHT.

10778 H. E. A. Wallis, London. Improved construction and arrangement of apparatus for conducting gas flame heat to hydrocarbon containing vessels for increasing the brilliancy or lighting power of coal gas. September 11

10781 G. A. Schoth, London. Improvements in and connected with apparatus or appliances for mixing air with coal and other gas or vapour, and the utilisation thereof for lighting purposes. September 11

10967 E. Coniston Mills, Altrincham. Improvements in apparatus for mechanically feeding fuel into furnaces. September 16

11188 T. Lowe, Old Radford. Purifying waste gas-lime and restoring for use again, for purifying gas and other purposes, and for utilising the products. September 21

11190 G. Pettigrew, Darlington. Improved arrangement of hydraulic main ascension pipes, and anti-dip valve for the manufacture of gas. September 21

11268 W. Barraclough, London. A new and improved method of producing from kerosene oil of any density flame (producing light and heat) to be emitted through a burner without the aid of a wick for use in lamps, stoves, and heating apparatus, and improved apparatus for the purpose of effecting the same. Complete specification. September 22

11358 R. Barker and H. B. F. Barker, London. Improved apparatus and appliances for consuming oils for the generation of steam, boiling of liquids, and like purposes, specially applicable to burning crude or unrefined liquid hydrocarbons. September 23

11359 R. Barker, London. Improvements in means for heating furnaces for smelting or roasting. September 23

11406 J. F. Smith and G. Duxbury, Leicester. An improvement in apparatus for heating all classes of public and private buildings. September 25

11520 R. Walker, Sunderland. Making and manufacturing compound fuel. September 28.

11646 F. Ducher and A. Serraillier, London, and T. Pléplu, Paris. Producing light and heat by means of an apparatus to which we give the name of hydrocarburator. September 30

11661 J. Foord and W. W. Paddon, London. Improvements in obtaining light and heat by the combustion of hydrocarbons, and in apparatus to be employed for this purpose. September 30

11713 H. Howell, Liverpool. Improvements in apparatus for manufacturing illuminating gas from volatile liquid hydrocarbons. October 1

11941 P. C. Bunn, London. Improvements in the preparation of oxides of iron, for use in gas purification, or for other purposes. October 7

12124 W. Smith, London. A new fuel. October 12

12129 G. E. Davis, London. Improvements in the manufacture of illuminating gas. October 12

12187 S. C. Joyce, W. Smith, and W. Neall, London. Patent non-charring wicks. October 13

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, Etc.

12059 M. Beaumont Parrington, London. Improvements in coke-ovens and in doors for the same, and for other furnaces. October 10

12298 H. Stier, Zwikau, Saxony. An improved process of extracting from carboniferous-materials the products met with, the processes of converting into gases and of withdrawing gases (for instance, process of distilling, of smouldering, and the like). Complete specification. October 15

IV.—COLOURING MATTERS AND DYES.

10831 H. H. Lake, London—Communicated by Wirth & Co., for Leonardt & Co., Germany. Improvements in the manufacture of colouring matters. September 12

10937 H. J. Haddan, London—Communicated by F. Bayer and Co., Germany. Improvements in the process of manufacturing paranitro-benzaldehydes. September 15

V.—TEXTILES: COTTON, WOOL, SILK, Etc.

10756 J. Smith, Jersey. Improvements in machinery for decorticating fibrous substances. September 11

11053 O. W. G. Briegleb, London—Communicated by H. Plaisier, Holland. Improvements in treating rhea or ramch. September 17

11129 J. Kenyon, London. A stiffening finish for crapes of all kinds, as silk, or silk and cotton, or cotton crape, also for linen, lace, or calico. September 25

11561 G. Kassner, London. A process or manner of manufacturing caoutchouc, wax, fat, colouring matter, vegetable fibre, fibre wool, and cattle food from lactucarious plants, or from plants or vegetables bearing milky juice, or from their extracts, such as opium, lactuca, and their likes. September 29

11660 G. F. Redfern, London—Communicated by E. Frémy and V. Urbain, France. Improvements in obtaining and treating fibres from the barks of plants of the Urtica family, and the like. Complete specification. September 30

11892 H. J. Haddan, London—Communicated by J. Breuer, France. Machinery for decorticating ramie and other textile plants. October 6

12011 G. F. Redfern, London—Communicated by C. de Baillencourt, France. Improvements in or applicable to machinery or apparatus for treating flax, hemp, and other textile materials. Complete specification. October 9

12055 W. H. Greenwood, Bradford. Improvements in apparatus for washing wool and other fibres. October 10

VI.—DYEING, CALICO PRINTING, PAPER STAINING, AND BLEACHING.

12002 J. Robertshaw, Manchester. Improvements in machinery employed in dyeing, sizing, and wringing hanks. October 9

12159 S. Smithson, Bradford. An improved method of and apparatus for dyeing. October 13